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SEPTEMBER, 1958

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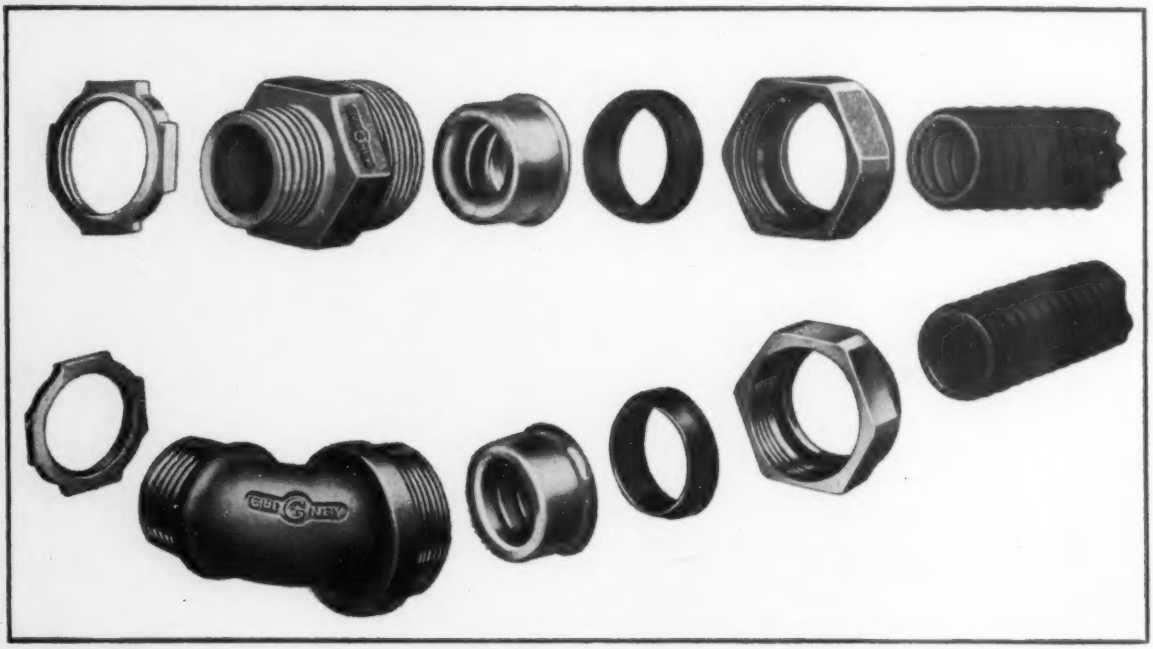

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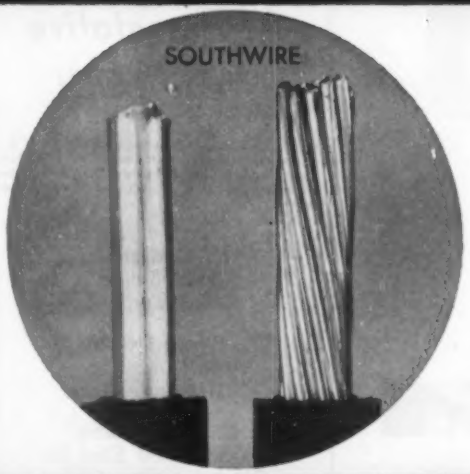

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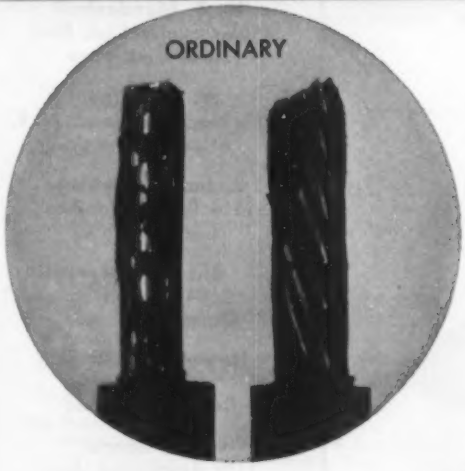

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

New economic statistics

The most recent release of the Office of Business Economics, United States Department of Commerce, is filled with many encouraging statistics in regard to our economic affairs. Most noteworthy of these are the statistics relating to personal income and wholesale prices.

Personal income has been the strange item in the recent recession discussions. For example, the seasonally adjusted figure for personal income showed a peak figure in excess of $350 billion in August of 1957. Then began a slow decline to a depth near $340 billion in February and March, 1958. Since then it has moved upward again, and in June it reached its previous high level. This means, of course, that personal incomes are at their highest levels in the history of this nation.

Another item of consequence in this respect is that the decline in personal income, some $10 billion, has been neither as severe nor as drawn out as the general decline in business. In a true depression or recession, personal incomes have a tendency to fall slightly after the decline in business but usually to a greater depth than business activity. So, although the current state of affairs has been termed a "recession," this is one economic situation that has not followed the normal rules of the game. It is a factor that bids well for an early pickup of business activity.

On the other hand, although still on a high plateau, wholesale prices showed definite signs of softening and might portend the beginning of a decline in the cost of living. A great deal of the decline was due to the drop in prices for farm products, which reached the lowest point on the wholesale price index since January, 1958. Farm prices were at their post war peak in March and have declined steadily ever since.

It is often true that wholesale prices lead retail prices by several months so it is quite possible that the downward trend may spread over into the retail field in the not far distant future. When the two trends are compared there is good reason to believe that trade will be stimulated as a natural course of events. Lower prices plus higher incomes do not often go together but when they do, the result is generally good business.

Trend in business failures

Another report from the same source is the trend in business failures. Under normal conditions, businesses fail at a rapid rate in times of poor business activity. This has been true under the most recent economic conditions. However, June is the fourth straight month in which business failures have been reduced. Although June is often a low month in this respect, abnormal conditions of today might have upset the trend. In June, only 1260 business failures were reported as compared with 1341 in May, 1458 in April, and 1495 in March.

Electric power production, reported by the Edison Electric Institute, also showed a marked increase with the index for this barometer rising to approximately 227.0 (1947-49 = 100). The electric utility industry has long been increasing its production as the growing industrial needs required, but a mild dip that occurred in the spring months of the year. has not as yet been overcome.

International affairs

The general quieting of the international tension, particularly in the Middle East, may be calming to some observers, but to others it appears that there will be no change in our defense spending regardless of the outcome. The fact that events, such as those encountered in Lebanon, Jordan, and Iraq, can happen in less time than overnight, did more to dramatize the need for preparedness than anything else could have done.

Since the Lebanon operation was essentially small-scale and did not burst into another World War, this nation was extremely fortunate in having adequate armaments and personnel available. If, on the other hand, a world-wide military explosion had occurred, our military resources might have been found wanting.

The result of this situation, then, is that the nation can expect a stepped up military-support program for the next several years. This will be principally in nuclear and scientific weapons but will also have impact upon more conventional armaments. The fact that this nation stands now committed to help free nations remain free anywhere and at anytime dramatically portrays the need for all out military preparedness. Nothing short of this goal would be either economically or politically sound.

The impact of government defense orders should bolster immeasurably the durable goods industries at a time when inventories are low and there is every reason to believe that normal consumption will increase. This is more true in the automotive industry than most others although the impact will be felt in steel, in electrical machinery, and in technical research and development. As long as the accent in business is production to satisfy both civilian and military demand and not to serve stockpile purposes, there should be every evidence of a strong economic fourth quarter.

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

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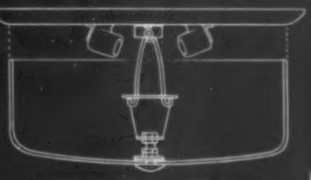

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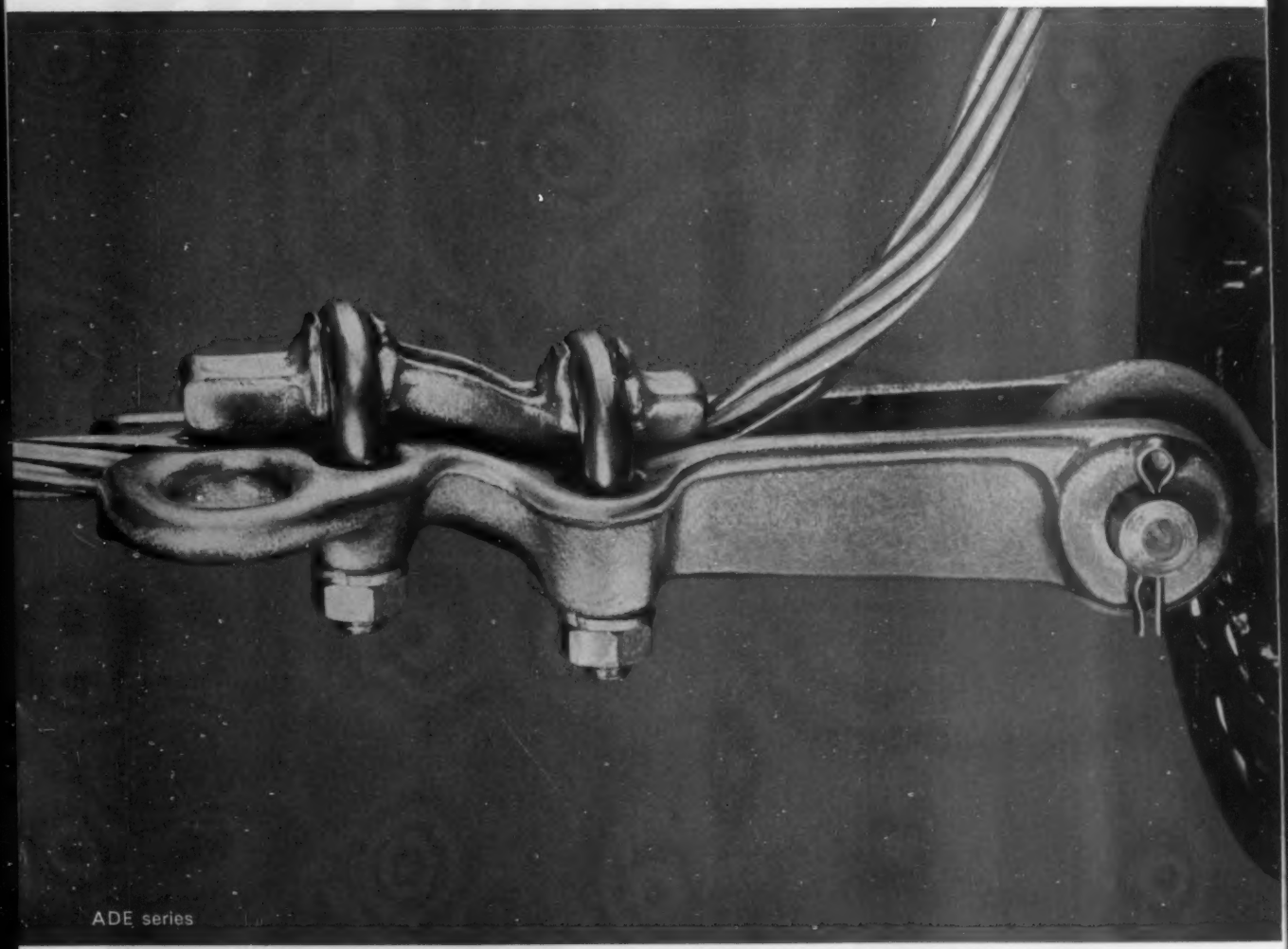

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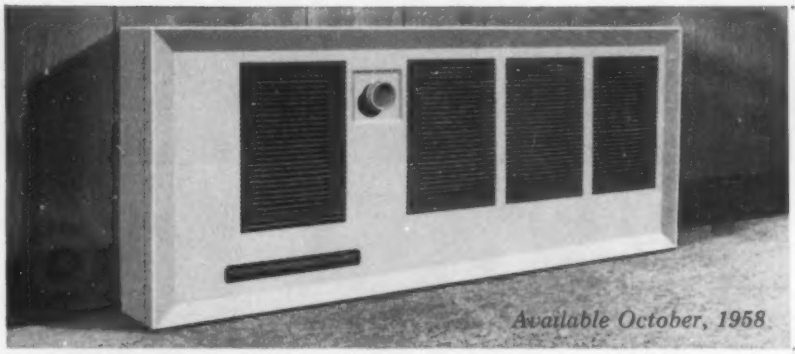

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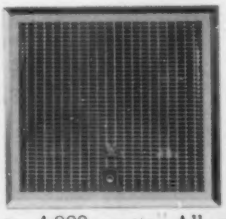

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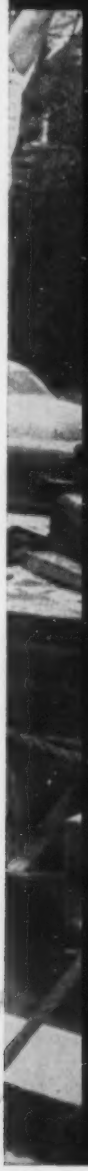
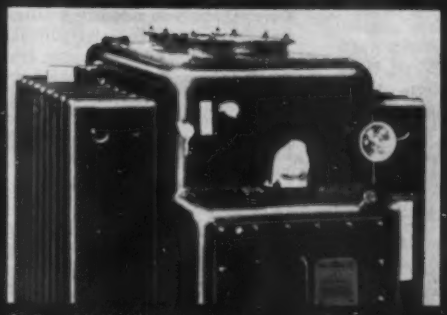
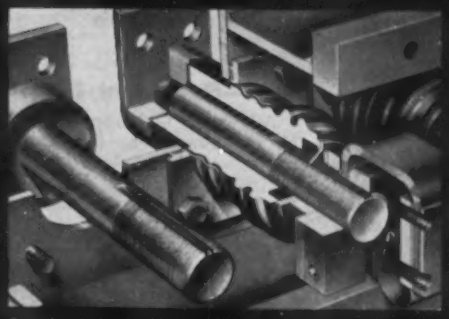
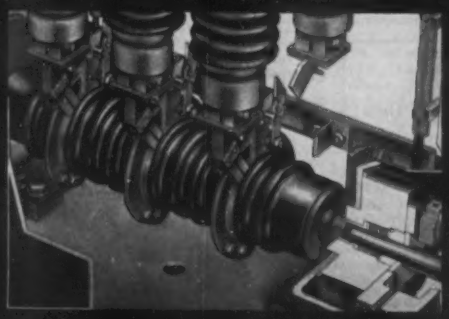




Contoured tank, Yukon coolers



Superior design bushings



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CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

1011—Electrical Conduits

"Natural Electric Conduits" is the title of the 30-page Catalog No. 603 which describes and illustrates the many types of electrical conduits that are manufactured by National Electric Products Corp., 2 Gateway Center, Pittsburgh 22, Pa.

1015—Squeezon Connectors

The Squeezon, a new compression connector for power lines, is fully described in bulletin "SQ" available from the James R. Kearney Corp., 4236 Clayton Ave., St. Louis 10, Mo. The Squeezon features greatly increased electrical and mechanical efficiency.

1019—Service Panels

Information on protective electrical control centers for homes, apartment buildings, service stations, and industrial applications is contained in Bulletin PM-385, "BullDog Pushmatic Electric-Centers," issued by BullDog Electric Products Co., 7610 Jos Campau, Detroit, Mich.

1097—Cord Catalog

A complete 48-page catalog is available from the Cornish Wire Co., 50 Church St., New York 7, N. Y. containing all data on flexible and portable cords, lamp cords, heater cords, cordsets, radio and electronic wires.

1103—Connectors

Comprehensive, up-to-date information on electrical connections for overhead lines in transmission and distribution is now available in one convenient publication, a 100-page manual issued by Burndy Corp., Norwalk, Conn., on connection techniques, connectors, and installation tooling.

1109—Anchoring Devices

An illustrated 32-page catalog, No. 65, describing more than 25 anchoring and drilling devices for making fastenings to masonry, is available from the Arro Expansion Bolt Co., Marion, Ohio.

1135—Wiring Devices

Catalog No. 56, and New Product Bulletins, containing the complete electrical wiring device line of Leviton Mfg. Co., Inc. Brooklyn 22, N. Y. Over 100-pages accurately illustrated and containing electrical and circuit wiring diagrams. Complete cross index for easy reference. Featured are Specification Grade Devices, Interchangeable line, Lev-O-Lock line, and many, many others; devices for every possible need and use in Industrial, Commercial and Residential applications.

1197—Convenience Outlets

Bulletin gives complete information on the new P&S No. 500 for adding extra outlets to existing installations. Everything you need in a single package—no steel boxes required. Available from Pass & Seymour, Inc., Dept. ES, Syracuse 9, N. Y.

1199—Bending Equipment

A concise eight-page brochure has been made available from Tal Bending Equipment, Inc., 417 N. Water St., Milwaukee 2, Wis., describing their "One Shot" bender line. The Tal bender uses the same frame for standard pipe, copper tubing, radiant heat coils, rigid and thinwall conduit, bus bar, flat, round or square stock—from ⅜ to eight inches.

1209—Fluorescent Ballasts

Advance Transformer Co., 2950 N. Western Ave., Chicago 18, Ill., has recently completed the compilation and printing of a 20-page catalog on fluorescent ballasts and their use. Included are data sheets on available Advance ballasts and a comprehensive installation and operation section and testing procedures. Copies of the booklet are available on request.

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1011	1015	1019	1097	1103
1109	1135	1197	1199	1209
1211	1219	1223	1227	1229
1233	1237	1245	1251	1253
1257	1259	1261	1263	1265
1267	1269	1271	1273	1275
1277				

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National Association of Electrical Distributors. Arthur W. Hooper, Executive Director, 298 Madison Ave., New York 17, N. Y.

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Electrical Equipment Representatives Association. Cy W. Sward, Executive Director, 1675 Fifth St., Clermont, Fla.

Electrical Manufacturers Representatives Association, Inc. George E. Clements, Secretary, 722 Stevenson Lane, Towson 4, Md.

Electrical Manufacturers' Representatives of Virginia, Inc. C. F. Bennett, Secretary, 205 West Grace St., Richmond 20, Va.

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Association of Independent Electrical Contractors. R. E. Neumann, Secretary, 704 Franchmen St., New Orleans 16, La.

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Shelby County Electrical Contractors Assn. A. M. Scruggs, Sr., Corresponding Secretary, 58 Buntyn St., Memphis 11, Tenn.

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NECA, Central Alabama Chapter. G. E. Thomason, Manager, 3516 Princess Ann St., Montgomery, Ala.

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NECA, West Virginia-Ohio Valley Chapter. Richard G. Dye, Manager, 510½ C St., South Charleston, W. Va.

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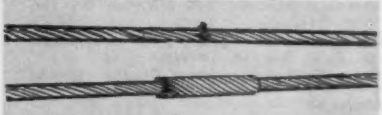
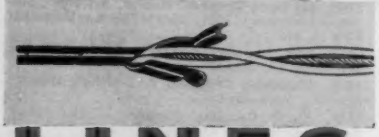
To protect and strengthen lines at points of maximum stress or where wear or breakage is likely to occur.

Economical conductor protection where short conductor spans and low tensions are used.

Provides maximum line protection on long spans at the points of clamp attachment.



For open-span repairs, where conductor damage is minor and is confined to the wires of the outer layer.



Protect wire coverings and prevent tree abrasion to overhead lines.

Made of galvanized steel, aluminum alloy or copperweld. Powerful non-slip grip makes them ideal for conductor dead-ending, guying or for service drops.

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NOW . . . through its Plastic Division, **FANNER** offers a wide variety of **INSULATING TUBINGS** and **MOULDINGS** for electrical purposes.

Enter Code Numbers of Catalogs Desired on Coupon on page 10.

1211—Fluorescent Fixtures

Catalog folder No. 911, "Peerlite by Guth," has been announced by the Edwin F. Guth Co., 2615 Washington Blvd., St. Louis 3, Mo. Copies of this new eight-page booklet are available from the company upon request. The booklet is designed for the lighting specialist, giving complete engineering data and dimensions.

1219—Electrical Enclosures

Catalog No. 5354-U is a compact 94-page catalog describing the complete line of steel and aluminum electrical enclosures manufactured for utility use by the B & C Metal Stamping Co., 590 Means St., N. W., Atlanta, Ga. The catalog is well illustrated and contains complete specifications as well as prices on all items in the B & C line.

1223—Circuit Protection

A 24-page illustrated handbook contains suggestions for selecting the right kind of protection for electric circuits, motors, appliances and apparatus. Includes motor wiring diagrams and a complete list showing proper size fuses to use. Available from Bussman Mfg. Co., University at Jefferson, St. Louis 7, Mo.

1227—Conduit Fittings

A new complete 24-page catalog illustrating their complete line of conduit fittings and lighting parts for the electrical wholesaler has been made available by Elliott Electric Products Co., 1513 Olmstead Ave., New York 62, N. Y.

1229—Switch and Outlet Boxes

A new RACO General Catalog is now available listing detailed information on boxes, covers, and bar hangers. The catalog includes data on numbers of wires permitted per box and a list of comparative catalog numbers. Copy available from All-Steel Equipment, Inc., Aurora, Ill.

1233—Troffer Catalog

A 36-page catalog, with complete information on their newly re-designed architectural troffers has been released by Smithcraft Lighting Division, Chelsea, Mass. Divided into sections for selection of lighting units, the catalog gives complete illustrations and data for 1 and 2 foot troffers in all types of ceiling construction. Also included in the catalog is information on ceiling lighting patterns, shielding designs, lighting techniques and applications.

HERE'S *double* PROTECTION

NOW galvanized Sherarduct is coated with NEW

FORMULA MVC-1

the modified vinyl copolymer that provides the most effective barrier against corrosive agents of all kinds

National Electric has developed a new way to combat conduit corrosion. It is called Formula MVC-1, a new modified polyvinyl chloride resin coating that's available only from National Electric.

Here's what MVC-1 does to even further increase the protection against corrosion offered by the Sherardizing process of galvanizing.

RESISTANCE TO CORROSIVE ATTACKS—In accelerated salt spray, sulphuric acid and caustic tests conducted by the Pittsburgh Testing Laboratories, new Sherarduct with Formula MVC-1 far outlasted all hot dipped and other high-grade coated and galvanized conduits tested.

RESISTANCE TO FLAKING—Formula MVC-1 makes a tight, uniform, adhesive coating that withstands bending without cracking or flaking.

TEMPERATURE RESISTANCE—Formula MVC-1 is extremely resistant to high and low ambient temperatures and will withstand the majority of all industrial temperature conditions.

NOW ADD THIS NEW CORROSION RESISTANCE TO SHERARDUCT'S OTHER FEATURES

1. The Sherardizing process of galvanizing that alloys zinc with the conduit walls.
2. Normalized, highly ductile steel for easy bending and threading.
3. Zinc protected threads for complete end-to-end protection.

These are the features that convince architects, engineers and contractors it is best to specify National Electric Sherarduct when real corrosion protection is required. Write for complete information on new Sherarduct today.

Listed by Underwriters' Laboratories, Inc.

Sherarduct *with MVC-1* is Galvanized Conduit at its Best

National Electric Products Corp.

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DOSSON "F" SPLIT BOLT CONNECTOR

Fabricated from high strength alloys (better than average steels), the Dosson "F" is cold-formed for uniform quality. Maximum contact pressure is assured by a high translation of tightening torque. Full length pressure bars with rounded edges prevent load concentration and crushing of conductor. Built to withstand high overload, vibration. Highly corrosion resistant.

Mail coupon for FREE Dosson "F" Connector

DOSSERT MFG. CORP.
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Gentlemen:
Please rush free sample Dosson "F" Split Bolt Connector plus catalog sheet.

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DOSSERT MFG. CORP.
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Enter Code Numbers of Catalogs Desired on Coupon on page 10.

1237—Wireholders

Knox Porcelain Corporation, Knoxville 1, Tenn. has recently redesigned a one-piece metal base style reinforced wireholder, No. 5009. Base and screw are hot dipped galvanized. This wireholder has extra sharp threads and quick starting point to make driving easy. KNOX manufacturers a complete line of Porcelain Wireholders, House Brackets, Service Entrance Mast Kits and Accessories and other Secondary Service Materials.

1253—Power Connectors

A completely new catalog (No. 526) of power connectors and bus support clamps is now available from Southern States Equipment Corp., Hampton, Ga., superseding catalog No. 525-R. Furnished in a handsome 7-ring binder, the new catalog includes sections on bus support clamps, couplers and angle braces, bar connectors, Tee connectors, stud connectors, ground connectors, parallel clamps, and terminals.

1257—Centrifugal Roof Ventilators

An 8-page, two-color folder (SDA-220) giving construction features, performance data, dimensions and recommended specifications for the new Centrifugal Roof Ventilator manufactured by The Peerless Electric Company, Warren, Ohio. Other important Peerless Fan and Blower products and a list of Peerless sales representatives are also included.

1259—Electrical Tapes

Twelve pages of specifications and application data make up an attractive booklet on Dutch Brand Electrical Tapes. Plastic, friction, and rubber tapes, as well as a vinyl tape made in nine different colors, are available from Dutch Brand Division, Johns-Manville, 7800 So. Woodlawn Ave., Chicago 19, Ill.

1261—Cable Puller

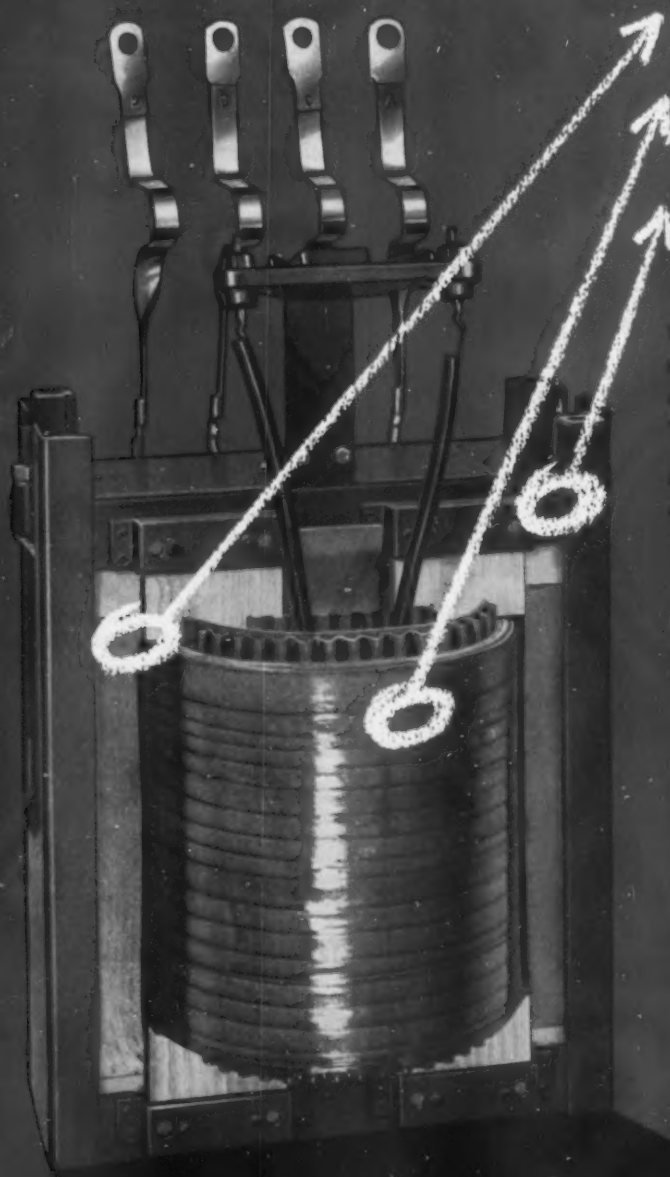
The electrically powered cable puller manufactured by The Barth Corp., 12650 Brookpart Rd., Cleveland 30, Ohio, is described in a new booklet. This tool is ideal for industrial and commercial construction and maintenance.

1263—Conduit Fittings

Bridgeport Fittings, Inc., 209 Center St., Bridgeport, Conn., offers a twenty-six page catalog describing their line of conduit, bushings, lock nuts, couplings, nipples, supports, connectors, and other fittings. Size, weight, and packaging details are included.

The new Moloney Distribution Transformers have improved efficiency and dependability. These improvements were made possible by the re-design of the entire core-and-coil assembly.

NOW IMPROVED EFFICIENCY . . . DEPENDABILITY



Features of this new design are:

- A completely new core which results in lower exciting current.
- The redesigned coil with lower losses and lower impedance giving better voltage regulation.
- A new framing structure and strong, adequate blocking keep the core-and-coil in the proper position even under short circuit conditions.
- Reduced weight.

Take advantage of these improvements which are the result of Moloney's continuous research and development programs . . . Specify Moloney Transformers . . . All Along The Line.

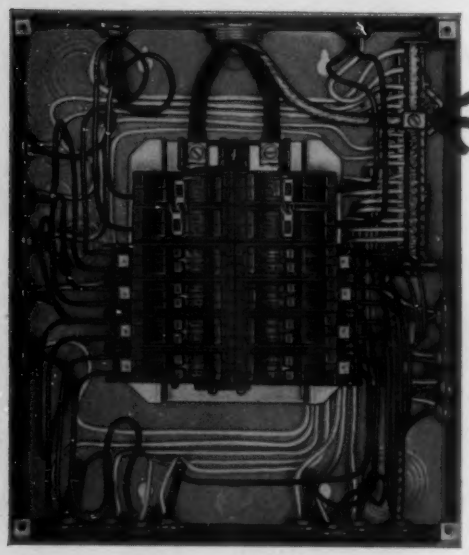
Moloney Pole Type Distribution Transformers are available in both conventional and CSP types.

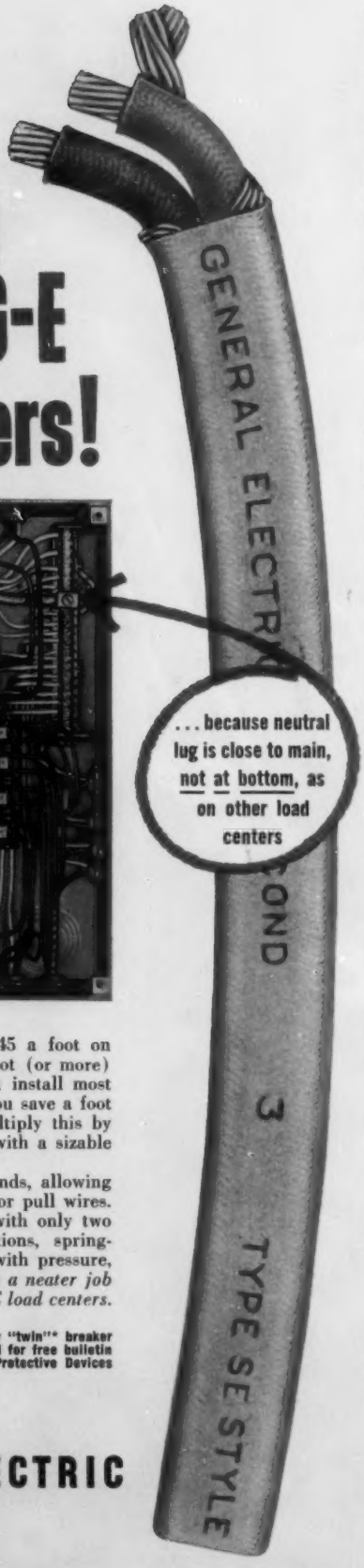
MOLONEY ELECTRIC COMPANY

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

SALES OFFICES IN ALL PRINCIPAL CITIES
FACTORIES AT ST. LOUIS 30, MO. AND TORONTO, ONT., CANADA

Save this much cable on G-E load centers!





...because neutral lug is close to main, not at bottom, as on other load centers

Incoming cable costs you about $.45 a foot on typical 100-amp jobs and $1.32 a foot (or more) for 200-amp installations. When you install most new General Electric load centers you save a foot or more of cable on each box. Multiply this by 25 or 50 homes and you'll end up with a sizable saving in your pocket.

Interiors snap in and out in seconds, allowing plenty of room to swing a hammer or pull wires. Box fronts hook on quickly—lock with only two captive screws. For flush installations, spring-mounted, snap-out interiors "give" with pressure, level breakers automatically. *You do a neater job in less time when you install new G-E load centers.*

See them at your G-E distributor's with the new "twin"* breaker —two rugged breakers in a one-inch case. Send for free bulletin GEA-6661A. General Electric Company, Circuit Protective Devices Dept., Plainville, Conn.

*TRADE-MARK

GENERAL ELECTRIC

Enter Code Numbers of Catalogs Desired on Coupon on page 10.

1265—Wire and Cable

Simplex Wire & Cable Co. announces a new catalogue of the family of ANHYDREX insulated cables. Catalogue No. 1028, which supersedes Nos. 1017 and 1018, is available on request from Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

1267—Guy Strand

An Engineering Data Sheet—E. D. 1878—describing the new Copperweld Type M Guy Strand. Contains table of physical properties as well as instructions for dead-ending this new high-strength, non-rusting guy strand. Available from Copperweld Steel Company, Frick Building, Pittsburgh 19, Pa.

1269—Hydraulic Power

A new bulletin describing the two-speed, fast-approach portable power for hydraulic tools obtainable from hydraulic power pumps is offered by Greenlee Tool Co., of Rockford, Ill.

1271—Power-Strut Channel

Three new bulletins have been issued containing specifications and application data on Power-Strut channels and related devices manufactured by Power-Strut, Inc., Framingham, Mass. No. 550 describes its use as surface raceway and lighting support; No. 560, electrical cable and duct supports; 580, movable Power-Strut walls.

1273—Ventilators and Range Hoods

The Ventrola Mfg. Co., Owosso, Michigan, has available a new 12 page catalog describing in detail their entire line of Ventilators (both kitchen and bathroom) and Push-button range hoods. Installation instruction sheets of all models are also available.

1275—Wiring Devices

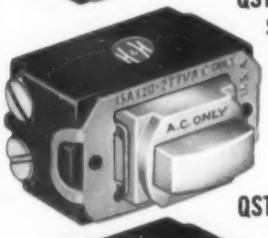
A complete new catalog of wiring devices is now available from Bell Electric Co., 5735 S. Claremont Ave., Chicago 36, Ill. The line includes a wide range of weatherproof receptacles and switches, portable garden lights, wall plates, and specialty items.

1277—Lighting Fixtures

A new completely detailed Catalog showing the latest in Indoor and Outdoor Lighting and Luminous Ceilings available from STA-BRITE FLUORESCENT MFG. COMPANY, Box 291, Riverside Sta., Miami, Fla.

Now ... *Two New Switches*

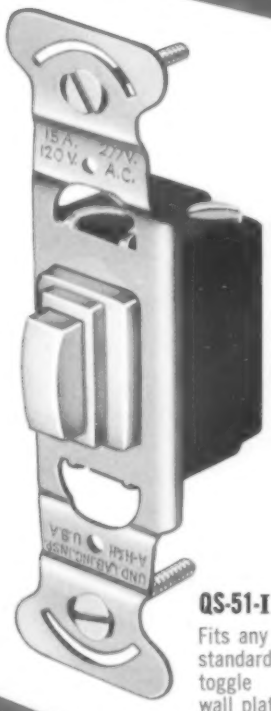
QST-51-I
Single Pole



QST-53-I
3-Way

QST-54-I
4-Way

SPECIFICATION GRADE
Fits any standard interchangeable wall plate



QS-51-I
Fits any standard toggle wall plate

The exclusive
INTERCHANGEABLE ..... *and the* Junior
... that complete the ARROW AH HART *line of*

Quiette®
TAP ACTION SWITCHES

The Arrow-Hart Quiette Tap Action Switch taps on or off with the gentlest pressure of finger-tip, hand or elbow anywhere on the button — truly electrical convenience at its finest. And now, addition of these two new switches — the small, compact Junior and the exclusive Arrow-Hart Interchangeable—makes Arrow-Hart the first and only complete line of Tap Action Switches available anywhere.

Featuring quiet mechanical operation, Arrow-Hart Quiette Tap Action Switches are constructed to insure long life and maximum electrical efficiency. They operate on full voltage without relays and provide safe control for incandescent or fluorescent lights and household appliances. Here, in fact, are tomorrow's switches . . . available *today!*

See reverse side for more information . . .

Completing our Tap Action Line . . .

2 NEW ARROW AH HART *Quiette* TAP ACTION SWITCHES

20 AMPERE

QST-201

QST-203

SPECIFICATION GRADE
Fits any standard interchangeable wall plate

Dimensions are the same for all Interchangeable Tap Action Switches

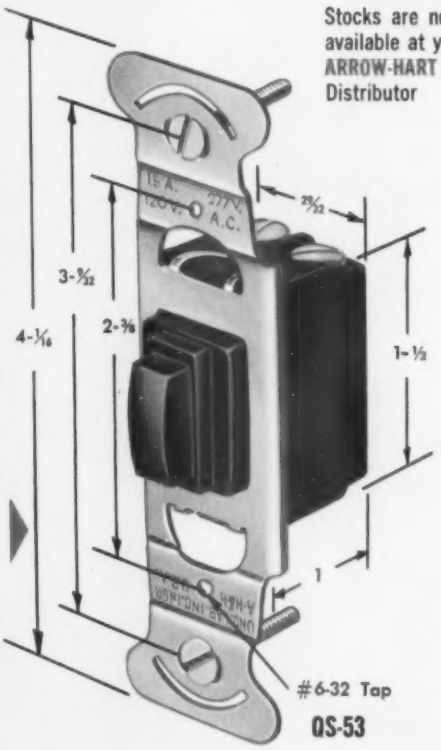
THE ARROW-HART INTERCHANGEABLE *Quiette* TAP ACTION SWITCH

. . . is the only switch of this type now available. It is available for 15 or 20 ampere operation at 120-277 volts, ac only. Switches are totally enclosed, have heavy silver alloy contacts, and can be installed in any position. Meeting Federal Specification W-S-893-A, they are approved for control of incandescent or fluorescent lights to full rated capacity and can be used to control motors where full load current does not exceed 80% of the current rating of the switch. Supplied with binding screw type terminals. H&H Specification Grade.

THE ARROW-HART *Junior Quiette* TAP ACTION SWITCH

. . . was developed to provide convenient, quiet operation at a lower cost than our Senior Tap Action Switch. The Junior Switch meets Federal Specification W-S-896-A and is rated at 15 amps, 120-277 volts, ac only. Supplied with binding screw type terminals.

Stocks are now available at your ARROW-HART Distributor



QS-53

INTERCHANGEABLE
120-277 VOLTS A.C.

CATALOG NO.*		DESCRIPTION
15 Amp	20 Amp	
QST-51	QST-201	Single Pole
QST-52	QST-202	Double Pole
QST-53	QST-203	Three-Way
QST-54	QST-204	Four-Way

Fits any standard interchangeable wall plate

Junior
15 AMP., 120-277 VOLTS A.C.

CATALOG NO.*	DESCRIPTION
QS-51	Single Pole
QS-52	Double Pole
QS-53	Three-Way
QS-54	Four-Way

Fits any standard toggle wall plate

**Operating buttons can be supplied with luminous inserts. If desired, add "LT" to the catalog number.*

**THESE NUMBERS INDICATE BROWN. ADD "I" FOR IVORYLITE.*

THE ARROW-HART & HEGEMAN ELECTRIC CO.
103 Hawthorn Street,
Hartford 6, Connecticut

Please send me product literature giving complete information on the Arrow-Hart INTERCHANGEABLE, Junior and Senior Quiette Tap Action Switches.

NAME _____

POSITION _____

COMPANY _____

CO. ADDRESS _____

CITY _____ ZONE _____ STATE _____

ES

ARROW AH HART

Quality since 1890

WIRING DEVICES • MOTOR CONTROLS
ENCLOSED SWITCHES • APPLIANCE SWITCHES

ANOTHER

MOE Light®

MONEY-MAKING NATIONWIDE PROMOTION

At your Moe Light dealer's now... and at very substantial savings ...just in time to re-fixture your home this fall... sparkling new lighting fixture designs... in modern, contemporary and traditional modes... created by world-famous *Moe Light* stylists... wrought in hand blown opal glass and polished brass... to bring out the charm of your living room... the warm hospitality of your recreation or family room... the graciousness of your dining area... the dainty beauty of your bedrooms. Wonderful opportunity to re-fixture... and save!

Special introductory prices only until November 30, 1958

Key to item	Moe Light Fixture	Model Number	Regular Price	Special Price
A	3-light cluster; 20" dia. with spreader in place	M-1527	$39.95	$34.95
B	Colonial pulldown; adjusts from 21" to 56"; shade, 16" dia.	M-1539	$47.95	$39.95
C	Pulldown, adjusts from 21" to 56"; shade, 16" dia.	M-1539	$39.95	$34.95
C	Pulldown, adjusts from 23" to 54"; shade, 16" dia.	M-1536	$39.95	$34.95
D	Pulldown, adjusts from 23" to 54"; shade, 16" dia.	M-1527	$16.95	$13.95
E	Matching pendant; body 13" high, shade, 4½" dia.			

PRICES ARE FOR FIXTURES ONLY

THOMAS INDUSTRIES INC.
LIGHTING FIXTURE DIVISION
Executive Office: 410 S. Third St., Louisville 2, Ky.
Leaders in Creative Lighting

THOMAS INDUSTRIES INC. products: Moe Light and Star Light lighting fixtures... Wright power saws... Radiant opal glass... Ideal bathroom cabinets... Sprayit paint spraying equipment.

STYLED BY GEORGE KERGUET AND ROBERT HEINMAN

Certified Inspiration Lighting Booklet—Your Key to Exciting Home Beauty through Dramatic Lighting—illustrates and explains C.I.L. principles. Send 10c for this inspiring guide to decorative home lighting—learn what YOU can do with C.I.L. lighting for your own home. Mail coupon TODAY!

MAIL COUPON TODAY!

THOMAS INDUSTRIES INC., Lighting Fixture Division
410 S. Third St., Louisville 2, Ky., Dept. HB-10

☐ I enclose 10c. Please send me illustrated "C.I.L. booklet" explaining *Certified Inspiration Lighting* principles as they may be applied to the exterior and various rooms throughout my home.

☐ Send name of my nearest *Moe Light* dealer.

Name _____

Address _____

City _____ Zone ____ State _____

FOR YOU

COLORFUL FULL PAGE NATIONAL ADS
in October and November:

Living
House Beautiful
American Home
House & Garden

Total Readers 19,650,000

FOR YOU

NEW FIXTURES— SPECIAL PRICES

5 exciting new "high style" lighting fixtures... at special prices to make people buy "TODAY"... and special prices to YOU, to increase your sales and PROFITS!

FOR YOU

FREE MERCHANDISING MATERIALS

Colorful 20" x 28" Display Poster... Hard-hitting Newspaper Ad Mats... to bring buyers into your store!

Moe Light's famous sure-fire promotions, now backed by an even BIGGER schedule of FULL PAGE color advertisements in MORE national magazines of proved pulling power, are tried-and-true SALES-BUILDERS for dealers. Contact your *Moe Light* distributor NOW... be sure to GET IN ON THIS BIG MOE LIGHT FALL PROMOTION.

THOMAS INDUSTRIES INC.
LIGHTING FIXTURE DIVISION DEPT. ES-9
Executive Offices: 410 S. Third St., Louisville 2, Ky.
Leaders in Creative Lighting

SORGEL — the Quietest dry-type transformers at standard prices

We Guarantee the sound level of ALL Sorgel dry-type transformers (not just a few) in

ALL ratings, ¼ to 10,000 Kva, 120 to 15,000 volts.

Certified tests furnished on request. Our modern testing facilities enable us to

Prove the low sound level, high efficiency, and low operating temperature.

We originated low sound level dry-type transformers many years ago, making them

More practical for installations in hospitals, schools, offices, stores, and other buildings where low sound level is an important factor.

Imitators claim low sound levels that can not be proved, or they apply only to limited ratings. They are

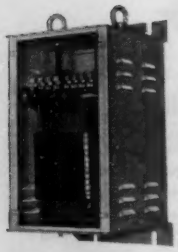
Not equal to Sorgel dry-type transformers.

Leading engineers and discriminating users have

Approved and endorsed Sorgel sound-rated transformers.

Substation Transformers

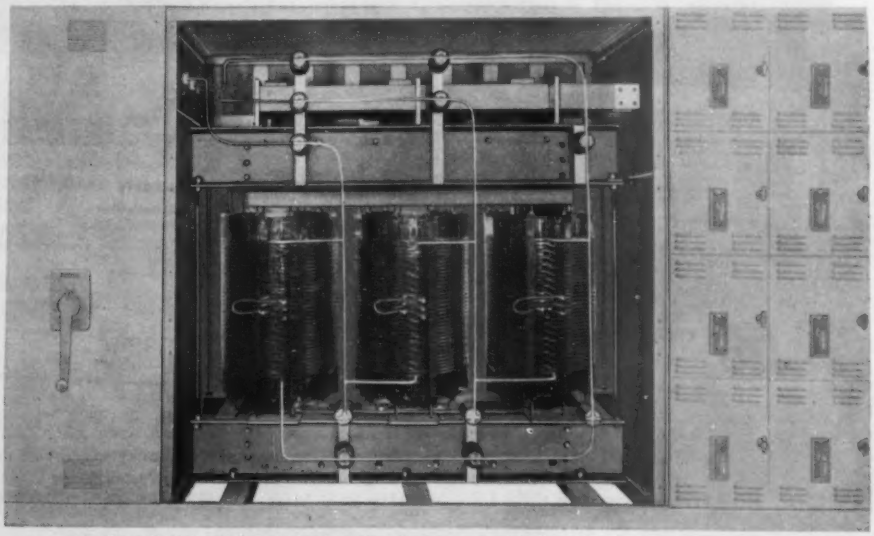
The same quiet Sorgel transformers, in ALL ratings up to 10,000 Kva and up to 15,000 volts, are also incorporated in substations.
Procurable with any type or make of switchgear, and from any substation manufacturer.



75 KVA single phase. 480/240 to 240/120 volts. Wall mounting transformer. Connection compartment panel removed.

Sales engineers in principal cities.

Consult the classified section of your telephone directory or communicate with our factory.



1000 Kva 13,200 volt Sorgel dry-type transformer in a substation—Compartment panel removed

SORGEL ELECTRIC CO., 835 West National Avenue, Milwaukee 4, Wisconsin

40 years' experience in the development, manufacturing and application of transformers

POINT THE WAY

with NEW, PROJECTED LETTER

FLUORESCENT EXIT UNITS by PERFECLITE

SURFACE TYPE UNIT

Check These Superior Features:

Phosphorescent Lucite' panel gives ½ hour after-glow should the circuit become dead. 6" projected letters. Available in models for all surface type as well as recessed installations. Mounted from top, back, side or from a pendant. Surface models are also available for either single or double face use. Pivot hinged, die formed 20 ga. steel frames for easy servicing. Surface type boxes are made of 18 ga. press drawn steel, ½" KO's top and side. Recessed boxes are of 20 ga. press drawn steel, six ½" KO's.

Lucite faces available in 4 color combinations — with or without arrows. Completely wired for two T-5 6-watt lamps, 118-V. AC ballasts. Also available for use in 277-V. systems.

You reduce installation costs, make every building safer when you select Perfeclite unbreakable projected letter fluorescent exit signs. For further information, mail the attached coupon today!

PERFECLITE PRODUCTS — THE MARK OF LIGHTING SERVICE

Units are Underwriters' Laboratories, Inc., approved, and comply with National Electrical Code.

THE PERFECLITE COMPANY

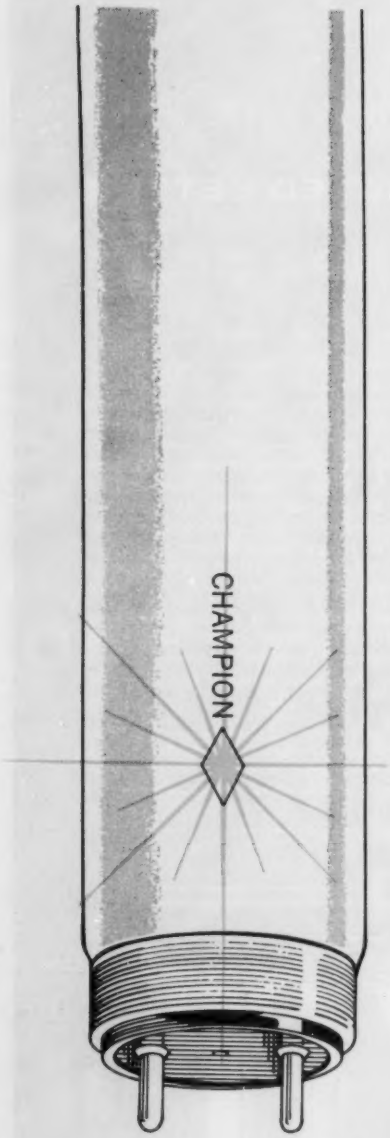
1457 EAST 40th STREET • CLEVELAND 3, OHIO

Please send me the Perfeclite Data Folder EX-58 C.

NAME _____

ADDRESS _____

CITY _____ STATE _____



low cost light

thanks to **CHAMPION**

LIGHTMANSHIP

NEW MAINTENANCE MANUAL— another example of Champion LIGHTmanship, an attitude and aptitude that makes sure you get all the light you pay for. Many useful, cost-saving hints have been added in this new edition of the popular guide that has proved to be of great practical value to lighting men everywhere. Copies available on your letterhead request.

MILLIONS OF LAMPS A YEAR . . . ONE PLANT standard of quality control

CHAMPION *Lamps*

Incandescent Fluorescent

Your best buy in lamps

CHAMPION LAMP WORKS
Lynn, Massachusetts
A division of Consolidated Electric Lamp Co.

THE MAGAZINE

For

SOUTHERN

ELECTRICAL MEN

Is . . .

ELECTRICAL SOUTH

Each month thousands of men engaged in the electrical industry throughout the South-Southwest meet through the pages of ELECTRICAL SOUTH for discussion and solution of mutual problems . . . presentation of new ideas and suggestions.

Why don't you join this monthly get-together? The modest subscription price of only $3.00 for THREE full years of informative, value-packed reading is an outstanding investment in your future.

If you aren't a subscriber, become one —or, if your subscription is about to lapse, renew it! The small expense will be returned to you many times in the thousands of pages of valuable information that will be yours for the next three years.

CLIP AND MAIL HANDY RENEWAL COUPON ON PAGE 121 TO

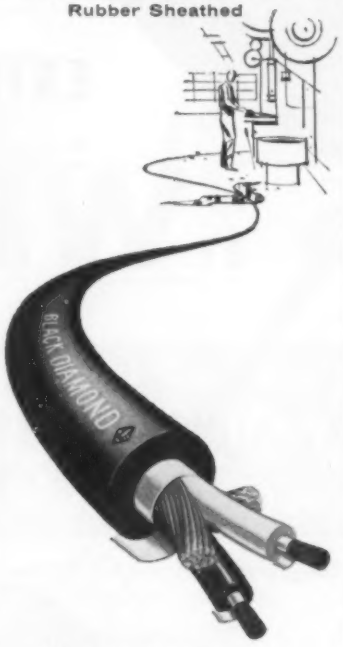
ELECTRICAL SOUTH
806 Peachtree St., N.E.,
Atlanta 8, Georgia

Diamond has all 3 portable cords

Red-D-Prene®
Neoprene Sheathed

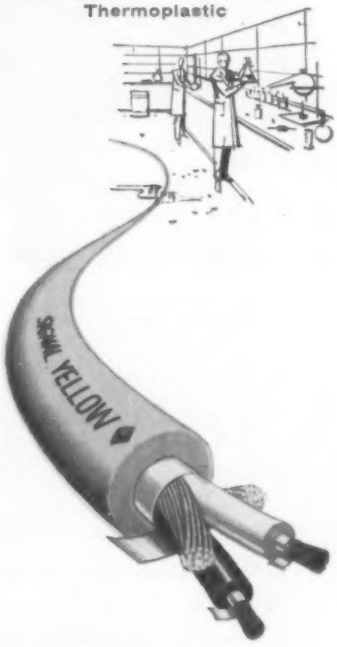
for hot, oily locations

Black Diamond
Rubber Sheathed



for general purpose use

Signal Yellow
Thermoplastic



for all locations where heat is no problem

Red-D-Prene for mill and plant use is designed with tough, oil, heat and flame resistant Type MD (Mill Duty) neoprene jacket in industrial red for ready identification.

Black Diamond has durable rubber jacket protecting against alkalies, acids and moisture. Very flexible construction prevents kinking in service.

Signal Yellow has a jacket of yellow thermoplastic that is quickly seen . . . clean to handle . . . smooth sheath will not readily collect dirt. Easy to pull.

ORDER FROM DIAMOND TODAY!

Trade Mark ®

DIAMOND
WIRE and **CABLE** Company
Sycamore, Illinois
WAREHOUSE: BIRMINGHAM, ALABAMA

THE ORIGINAL DUAL-GRIP ENTRANCE HEADS*

BY WEAVER

LOOK FOR THE PATENT NUMBER—
YOUR PROTECTION AGAINST COPIES!
*U. S. PAT. NO. 2,739,999

easier to use . . . just tighten the screws

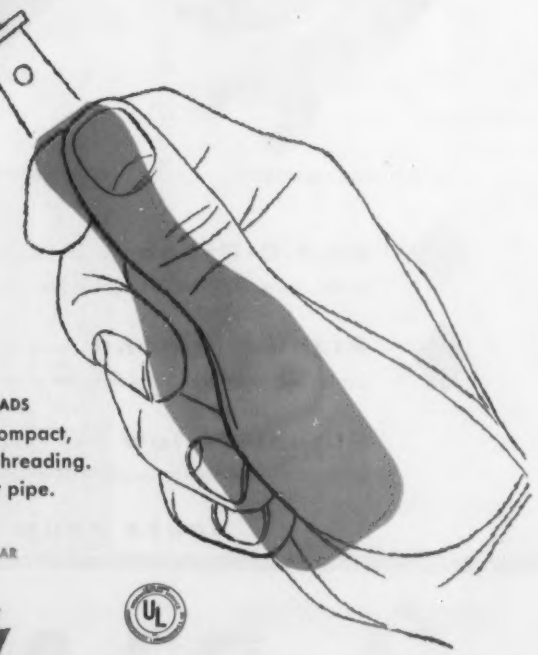
"Dual-Grips" save time and money.
When "Dual-Grips" are used on EMT,
they're "on to stay"
—with no special fittings.

With rigid conduit, the electrician just slips the head on and tightens the screws.
No valuable time wasted cutting threads.

Lightweight aluminum alloy — moistureproof—rust proof. Eight sizes: ½", ¾", 1", 1¼", 1½", 2", 2½", 3".

NEW COMBINATION ENTRANCE HEADS
. . . head and reducer in one compact, easily installed unit! No mast threading. For 2" or 2½" rigid conduit or pipe.

MR. WHOLESALER: STOCK THESE POPULAR HEADS NOW — THEY SELL!



J. A. WEAVER Company

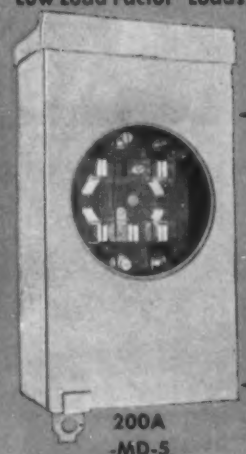
2110 HOWARD ST., ST. LOUIS 6, MO.

telephone CEntral 1-8100

CAPACITY! CONTINUED IMPROVEMENT!

TYPE MD

Now "High Capacity" with reinforced jaws. Particularly applicable for 200 amp. service on residential or other "Low Load Factor" Loads.

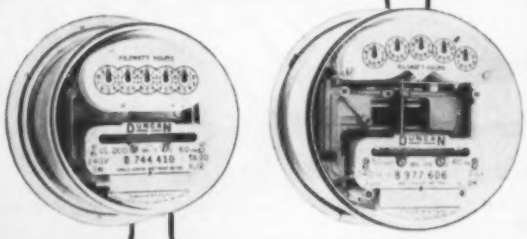


200A
-MD-5

DUNCAN

METERS AND MOUNTING DEVICES

—up to 200 amperes of service capacity using Self-Contained Extended Range Meters



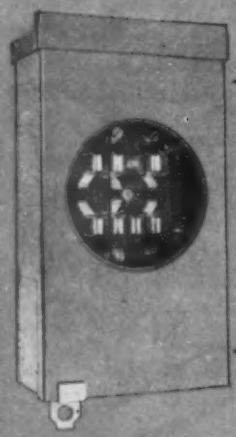
TYPE HD

for "High Demand, High Load Factor" Loads.

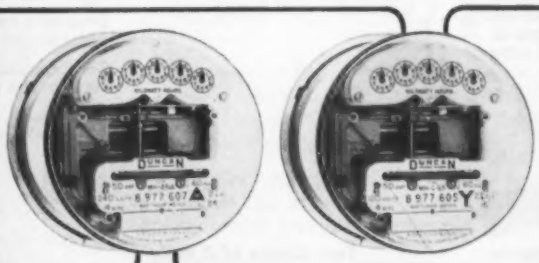
200A
-HD-5

MD Companion Devices for the **CLASS 200** meter —pioneered by Duncan **HD**

175A
-MD-7



All HD and MD Devices have arrangements for manual by-passing.



200A
-HD-7

for TOP ECONOMY

DESIGNED FOR THE SERVICE

for MAXIMUM CAPACITY

DUNCAN ELECTRIC CO., INC. LAFAYETTE, INDIANA

LIVE BETTER ELECTRICALLY WITH FULL HOUSEPOWER

DEAD END WITH

BLACKBURN

W6-2A from 6 Sol to 2 ACSR
This Clamp Will Handle All
Popular Service Drop Wires

WEDGE CLAMPS

For Light Service
W6-4A
6 Sol to 4 ACSR

For Heavy Service
W2-OA
2 Sol to 1/0 ACSR

Conductor in contact with wedge for entire length of slider.

Removable aluminum slider allows installation without threading through clamp.

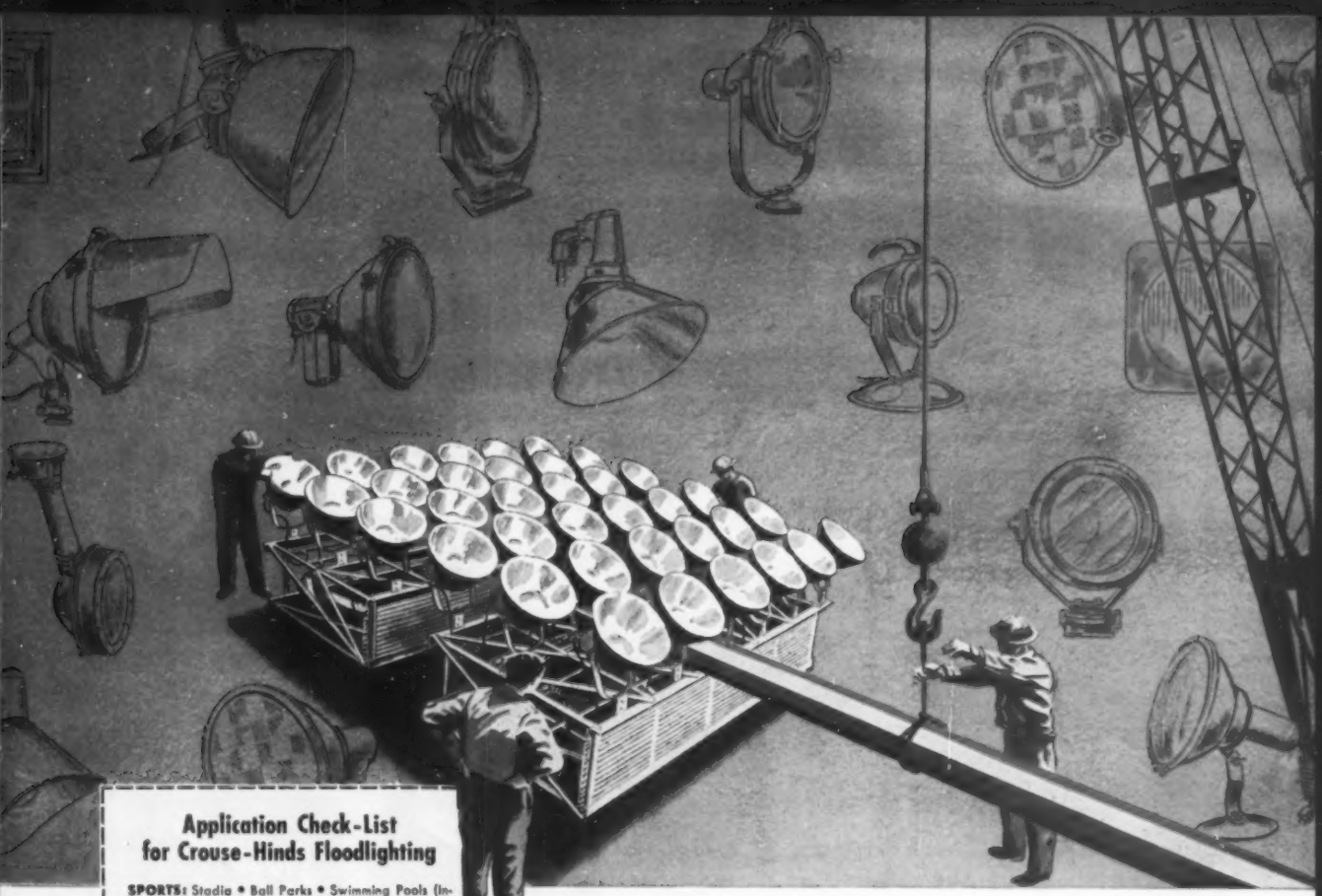
Drop wire can be pre-sagged and cut to exact length needed.

Can be attached to bare neutral at any point in the span.

Your Choice of 3 Bails

STANDARD | FLEXIBLE CAPTURED | FLEXIBLE FREE

JASPER BLACKBURN CORPORATION 1525 WOODSON RD., ST. LOUIS 14, MO., WYDOWN 3-9430



Application Check-List for Crouse-Hinds Floodlighting

SPORTS: Stadia • Ball Parks • Swimming Pools (Indoor & Outdoor) • Gymnasiums • All Summer & Winter Sports (Indoor & Outdoor)

DECORATIVE & DISPLAY: Statues, Fountains, Memorials & Monuments • Public Gardens • Building Fronts & Entrances • Park, Playground & Cemetery Entrances & Interiors

BUSINESS: Shopping Areas • Drive-Ins, Outdoor Theaters • Building Fronts & Entrances • Recreation Parks • Gas Stations

AIRPORT: Ramps • Boarding & Loading • Street & Road Approaches to Airport • Markers & Beacons • Emergency Portables

CONSTRUCTION: Roads & Streets • Dams, Seaways & Piers • Detours • Buildings • Reconstruction of Disaster Areas

INDUSTRIAL AND UTILITY: Parking Areas • Freight Yards • Weigh Stations • Docks & Piers • Staging Areas • Production Work Areas

TRAFFIC: Tunnels • Viaducts • Bridges • Underpasses • Walks • Public Squares, Thruway Interchanges & Rest Areas • Cloverleafs • Parking Areas

UNDERWATER: Swimming Pools (Indoor & Outdoor) • Marine Life Displays • Municipal Garden Pools • Aquariums • Divers' Portable Units

HAZARDOUS: Explosion-Proof Lighting for: Petroleum Refineries • Chemical Plants • Explosive Plants • Service Stations

SPECIAL PURPOSE: Plant Protection (Floodlighting for Safety) • Estate Lighting • Portable Floodlighting for Parades, Bandstands, etc.

A NATIONWIDE **DISTRIBUTION** exclusively through **ELECTRICAL DISTRIBUTORS**

Incandescent or Mercury Vapor...*you can get a*

CROUSE-HINDS Floodlight ...for every possible application

Name your floodlighting need – for construction, emergency, utility, traffic, display, decoration, sports, underwater, or hazardous-area use. Crouse-Hinds can supply floodlights *designed specifically for each application.*

A quick scanning of the widely varied applications included in the Check-List at left proves again that floodlights often provide *better light from few source points at less cost* than conventional lighting.

For the broadest experience and skill in every conceivable situation where floodlighting may be of use . . . call on Crouse-Hinds. Our field engineers will gladly assist with your planning. Just call your Crouse-Hinds distributor, or the nearest sales office or representative listed below.

Send us a brief description of your lighting problem, or an indication of the floodlight types in which you are interested. We will send literature containing product information applying to your problem by return mail.

CROUSE-HINDS COMPANY

Main Office and Factory: Syracuse, N. Y.
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

RACO

You Can Always Rely On RACO

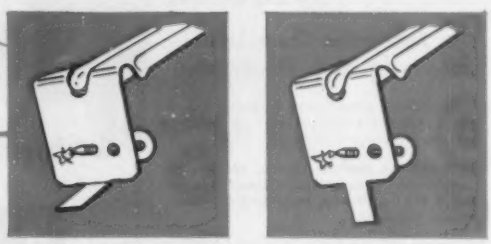
ADJUSTABLE BARS

✓ QUICKLY POSITIONED
✓ EASILY INSTALLED
✓ SAVES TIME

NEW STOP-LOCK

Prevents bar from slipping apart accidentally. Permits separation of bar if desired.

SELF-GAUGING



SHALLOW OFFSET

Place gauging lug against edge of rafter or joist and nail in place.

DEEP OFFSET

Straighten gauging lug and line up flush with edge of rafter or joist.

SERRATED NAILS ARE PRE-ASSEMBLED TO THE BAR

Ready for immediate installation.
No hunting for nails.

✓ EXTRA STRONG

THE ONLY BAR ON THE MARKET WITH RIGID "M" CONSTRUCTION

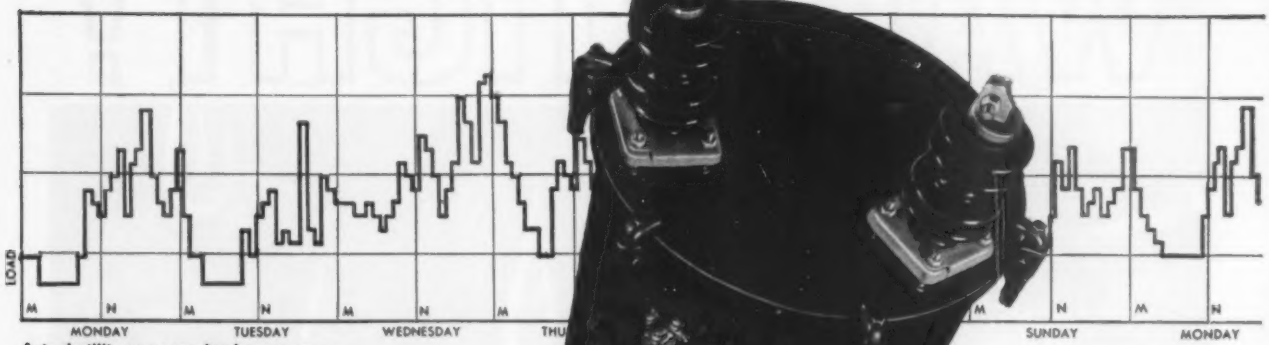
RACO Adjustable Bars have been vastly improved. Note these extra advantages . . . pre-assembled serrated nails for easy installing . . . self-gauging lugs for fast positioning . . . friction stop-lock that prevents bars from accidentally slipping apart. High quality electro-galvanized finish. Write today for new bulletin describing these superior Raco Adjustable Bars.

ONLY 4 BARS DO THE WORK OF 16

Simplifies stock control . . . requires less investment in inventory. Two sizes fit most every job.

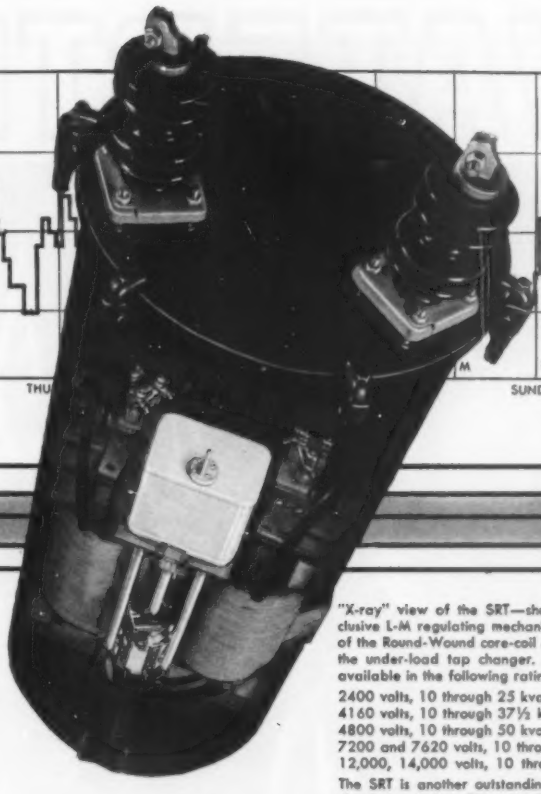
RACO

ALL-STEEL EQUIPMENT INC. Aurora, Illinois



Actual utility company load curve on a transformer for an August week.

With SRT, voltage would have been kept within the band width (blue lines)



"X-ray" view of the SRT—showing the exclusive L-M regulating mechanism at the top of the Round-Wound core-coil assembly, and the under-load tap changer. SRT's will be available in the following ratings:

2400 volts, 10 through 25 kva
4160 volts, 10 through 37½ kva
4800 volts, 10 through 50 kva
7200 and 7620 volts, 10 through 75 kva
12,000, 14,000 volts, 10 through 100 kva

The SRT is another outstanding engineering development of the Thomas A. Edison Laboratories of McGraw-Edison Company.

HERE is L-M's New SRT the World's First Self-Regulating distribution Transformer

Provides regulation at the point of use; corrects overvoltage and undervoltage in four 2½% steps; improves utility company revenue and provides better service for utility customers.

By **ROBERT P. THOMPSON**
Manager of Engineering, Transformers
Line Material Industries

The new L-M Self-Regulating distribution Transformer should make an outstanding contribution to profitable, economical utility operation. By providing regulation *at the point of use*, the SRT improves revenue by avoiding loss in billings caused by *undervoltage;* and it gives customers better service by more efficient operation of lights, appliances, and all other electrical devices. By preventing *overvoltage*, it reduces burnouts of lamps and television tubes.

L-M Round-Wound Design

The SRT is basically a Round-Wound® transformer with extra taps on the *primary*, and an under-load tap changer. The voltage regulating mechanism is volt-sensitive on the *secondary*, so voltage is maintained within a 3½-volt band width centered around 120 volts.

"Adapt-A-Tap" Range Selector

The "Adapt-A-Tap" range selector provides a full 20% range within which the taps for the 10% automatic regulation may be selected—all below, straddle, or all above normal. Thus the SRT may be located anywhere on the line—at the end, in the middle, or near the substation. Four 2½% steps are provided. Operation occurs only after a time delay to prevent undesirable operation and "hunting" on switching surges and momentary voltage changes outside the band width.

More Economical Regulation

The SRT provides extremely economical regulation, *at the point of use*, and it opens wider horizons to the distribution system design engineer for more effective system planning.

Sold For Test Program

The limited initial production of SRT's will be sold to utility companies who wish to make thorough tests of the possibilities of this revolutionary new engineering development. These tests should enable utilities to determine the extent to which SRT's may be applied, and the best methods of application.

Ask The L-M Field Engineer

For details about the SRT, ask the L-M Field Engineer who calls on your company; or write A. R. Waehner, Director of Transformer Sales, Line Material Industries, Milwaukee 1.

LINE MATERIAL Industries
McGRAW-EDISON COMPANY
Distribution Transformers

McGRAW EDISON

WATERTIGHT!

Another fine product!

Underfloor Duct by

ORANGEBURG®

For Distribution of Electrical Wiring in Commercial, Industrial and Institutional Buildings

Since 1921 Non-Metallic Underfloor Duct by Orangeburg has been selected for many of the country's outstanding buildings because of its safety, flexibility and low installed-cost. To learn how an Orangeburg Underfloor Duct System keeps a building *electrically* modern for its lifetime, write for Catalog 201.

Orangeburg Fibre Conduit Prolongs Cable Life

Keep out corrosive ground waters, and you prolong the life of underground cables, say utility engineers!

Why? Because ground waters containing corrosive elements derived from the soil and concrete encasement attack cable sheath and shorten cable life. Orangeburg's impermeable wall and self-sealing Taper-Sleeve Joint shed them *"like water off a duck's back."* You get maximum protection with Orangeburg.

Orangeburg protects cables in many other ways. Smooth bore, low co-efficient of friction reduce incidence of abrasion. Its material is strong, tough, resilient, durable.

No other conduit is easier to install

Light, 8-foot lengths and a complete line of bends and fittings speed installation. Taper-Sleeve Joints tap water-tight in a jiffy. Orangeburg lays faster and at lower cost than any other type of conduit.

Orangeburg Fibre Conduit has prolonged cable life at minimum expense for utilities, municipalities and industry since 1893.

Distributed by Graybar Electric Company and by General Electric Supply Company. Branches and stocks in principal cities.

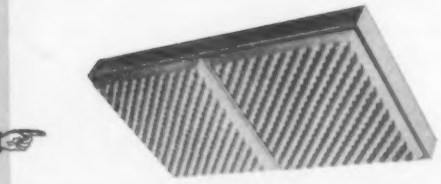
WRITE DEPT. ES-98 FOR CAT. 52

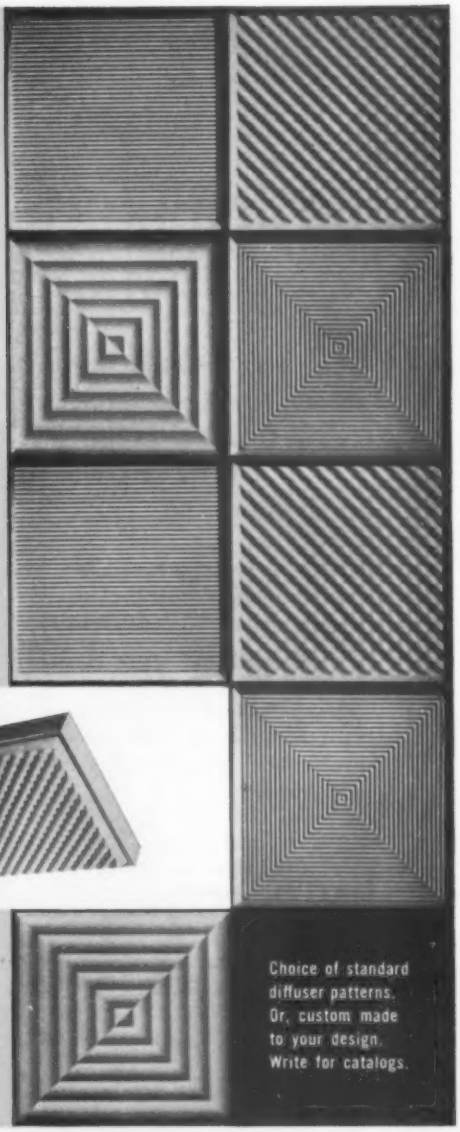
ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®

FIBRE CONDUIT

THIS IS THE FIXTURE THAT IS STILL FIRST CHOICE





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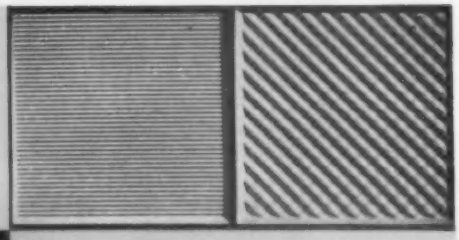

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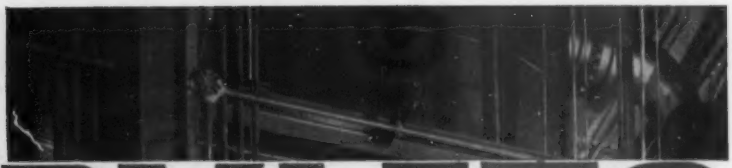

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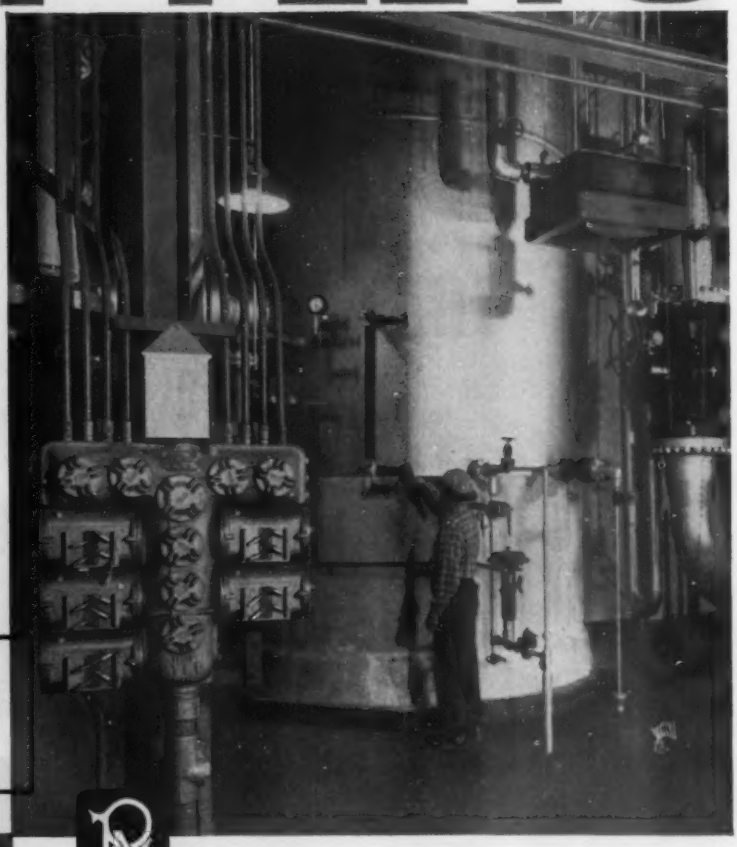

Pyle-National panelboard, lighting fixtures, and other Pylets in Absorption & Dehydrating building, McMahon Gas Processing Plant. Stearns-Roger Engineering Co., Ltd. specified Pyle-National controls, conduit fittings and lighting fixtures throughout.

O-J SERIES Threaded cover junction PYLETS with any arrangement of

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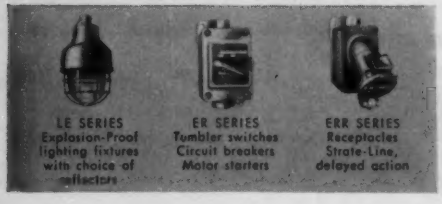

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distribution transformers

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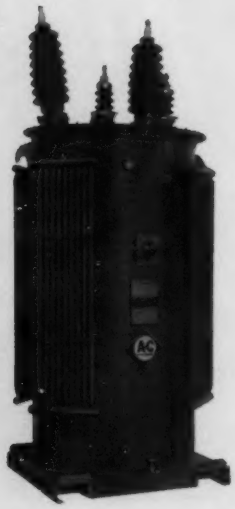

SPECIAL tank positioners permit Allis-Chalmers welders to use the down-hand method in electric arc welding. This results in better welding accuracy and quality, guarantees strong, oiltight tanks. Closely controlled welding temperatures, expertly calculated weld sizes and fillets, pressure testing of all tanks after welding, add further assurance of quality. This is but one of the many reasons why Allis-Chalmers distribution transformers last longer, perform better with far less maintenance.

For all the good reasons why Allis-Chalmers transformers are superior, ask your A-C man. Or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

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Youngstown "Buckeye" steel conduit

This highly-functional modernistic department store building—only one of many new structures that will make up Denver's Zeckendorf Plaza Development—has built-in lifetime wiring protection, thanks to Youngstown "Buckeye" Full Weight Rigid Steel Conduit.

Damaging elements such as water, moisture, vapor, dust and dirt can never cause disruption of the building's all-important electrical system, because "Buckeye" Conduit will perform its protective function as long as the structure remains standing.

Installation of Youngstown "Buckeye" Conduit is shown during construction of the new May-D&F Department Store in Denver, Colorado.

Zeckendorf Plaza Development,
Denver, Colorado
OWNER: *Webb & Knapp, Inc., Denver, Colorado.*
ARCHITECT: *I. M. Pei & Associates, 385 Madison Ave., New York, N. Y.*
GENERAL CONTRACTORS: *Webb & Knapp Construction Corp., New York, N. Y.*
ELECTRICAL CONTRACTORS: *Fischbach and Moore Incorporated, 8412 Mile High Center, Denver, Colorado.*
CONDUIT SUPPLIER: *The Mine & Smelter Supply Co., 3800 Race Street, Denver, Colorado.*

When you specify "Buckeye" Conduit, the high standards of Youngstown *quality*, the personal touch in Youngstown *service* will help you create electrical wiring systems with an "accent on excellence".

Carefully selected Continuous Weld pipe
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Complex and efficient electric

By Hal M. Newsome

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electrical Utilities ✔
Electrical Wholesalers ✔
Electrical Inspectors ✔
Industrial Engineers ✔
Consulting Engineers ✔

◆ ONE OF THE MOST modern and streamlined newspaper plants in the South was completed recently by the Miami News (Florida). It incorporates a complex and efficient electrical system installed by Contractor E. C. "Red" Cornelius of that city. The total electrical job cost approached a million dollars.

The 21 large new presses and the whole operation of feeding newsprint through them are automatically and electronically controlled by an elaborate and intricate custom-built electrical system which required more than a million feet of wire for the controls alone.

Uninterrupted service

The seven-million-dollar, two-story building provides 176,000 sq. ft. of space, and both the plant and the electrical system were designed to make the production of the newspaper almost an assembly-line operation. It is planned for foolproof, flexible, and uninterrupted service, with the electrical power and controls as the very "heart" of this synchronized operation at every individual stage.

The work flow begins in the editorial and advertising departments, at the east end of the low tropical-type building, and the "copy" is transmitted to the huge rolls of costly newsprint which are automatically conveyed and manipulated through all the amazing processes until the newspapers, printed, folded, and ready for delivery to the easy chair, come out on the loading platforms at the west end.

The plant is 98% air conditioned, which includes even the steaming-hot stereotyping department, where the craftsmen who deal with molten metal had long thought they were doomed to a lifetime of heavy sweating. Cooling is provided by three 400-hp central units.

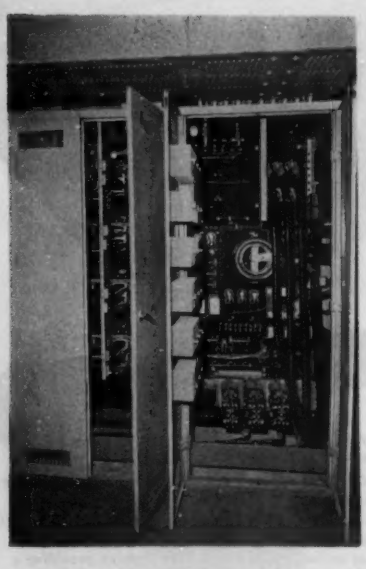
Printing process control

The outstanding electrical feature of the job is the automatic control of all technical printing processes which is centered in a 42-ft. bank of varied and integrated control panels that handle every move of the 21 presses and three large folding machines.

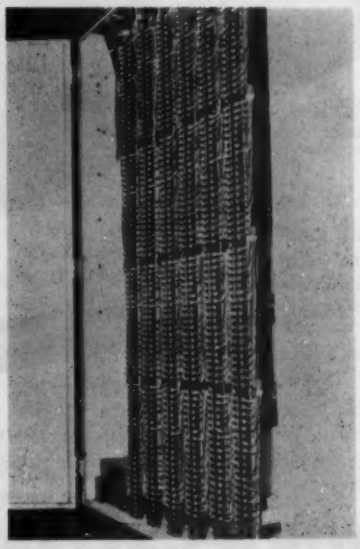
An electrically - actuated conveyor system transports all finished stereotyped lead plates from the casting room to the presses—and then, after they are used, from the presses back to the melting pot for re-use. The molten metal is then pumped electrically to a predetermined level in the casting box on the floor above from which it can be drawn by gravity. The temperature is electrically maintained, and this whole set-up is a new and labor-saving process.

Triple primaries

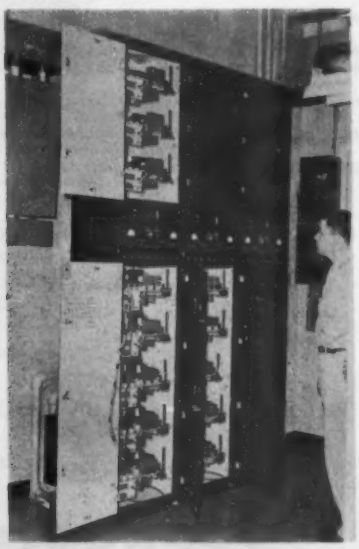
Because safe and uninterrupted service was necessary, and also because the plant is some distance from other industrial areas, the designers and the power company provided *triple* primary circuits. This was the first and is still one of the few installations in Dade County with *more* than dual primaries. The two large safety vaults provide room for six 1,000-kva transformers which convert the



Magnetic panel for speed control of Miami News presses.



Terminal panel of automatic controls permits easy testing.



Electric eye panel for control of color register.

system serves Miami newspaper

13,200-volt entrance service to a 277/480-volt Y service.

There is an automatic "switch-over" system between the first and second primaries, and the third set can be cut in manually. These primaries are all in conduits so that they can be pulled and replaced if necessary.

All of the parking lot lighting system, the electrical service entrance, and the high-voltage connections between the vaults were installed underground in concrete-encased conduits making them oil-proof, heat-proof, and water-proof. The Cornelius firm did all of the trenching with their own equipment.

In order to supply adequate reserve power, the power company built additional transmission lines all the way from their main generating plant.

The News people know by long experience how many things can go wrong and how helpless they are without complete and reliable electrical service of many kinds at many points; so they pulled out all the stops in designing and building a system that will "get out those papers, come 'hail' or high water."

The Y-system secondaries coming from the vault provide 480-volt 3-phase feeds for all motors throughout the plant. The common neutral, which also runs throughout the system, in combination with any one of the phase wires also provides 277 volts for most of the lighting circuits. These are fluorescent units with each fixture being individually fused.

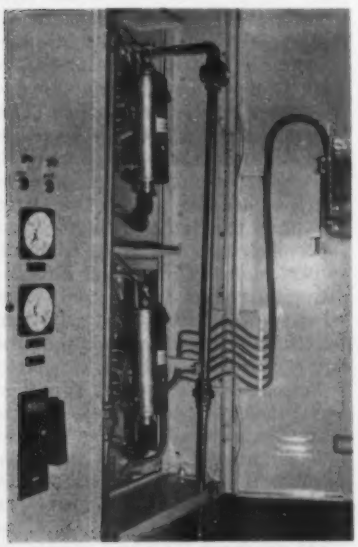
To supply 220 volts for special equipment, such as linotype machines and others, the 480-volt circuits are stepped down through dry-type transformers wherever needed. Also "convenience" outlets for 120/208 volts are distributed throughout the plant. These are served by other dry transformers working off the 480-volt lines. Over 20 dry transformers ranging from 5 to 225 kw are spotted through the building.

Full voltage desirable

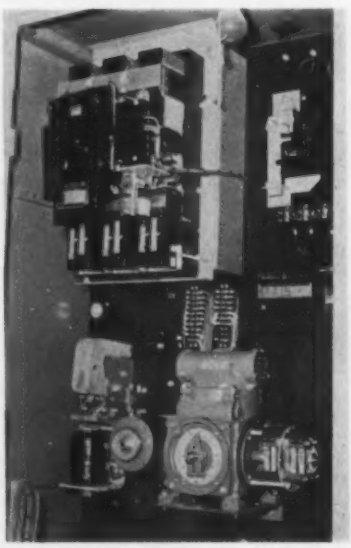
To secure all these different voltages and also to keep the copper cost down and eliminate voltage drops throughout the 400-ft. long building, the 480-volt Y system is regarded as a very sound design which is working out well; it affords at reasonable construction cost, an adequate and flexible reserve service at all points. Full voltage is regarded as very desirable, as most Miami homes do not have central heating, and peak-loads for large numbers of individual electric heaters tend to reduce the normal reserve of all systems during cold snaps.

Instead of using motor generators to supply the d-c needed for the variable-speed drives on the presses—as in most older newspaper plants—the News installed three rectifier cabinets to convert the a-c to d-c. The rectifiers have the advantages of quietness, no moving parts to wear, coolness through water cooling, and very low maintenance costs. Each rectifier cabinet affords a 300-kw supply.

On the press-line and control circuits, all of the many hundreds of terminals are connected with stranded wire and Stakon terminal lugs. This not only provides a firm connection, but permits the easy isolation and selection of each terminal wire for testing in case of trouble. Merely loosening one screw permits immediate hooking up of test equipment. Also the stranded wire has less tendency to metal fatigue and breakage from



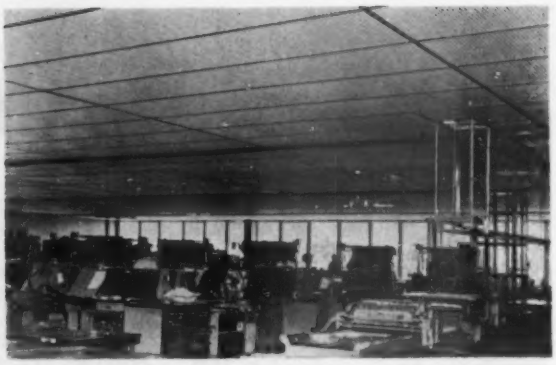
One of three ignitron rectifiers which convert a-c to d-c.



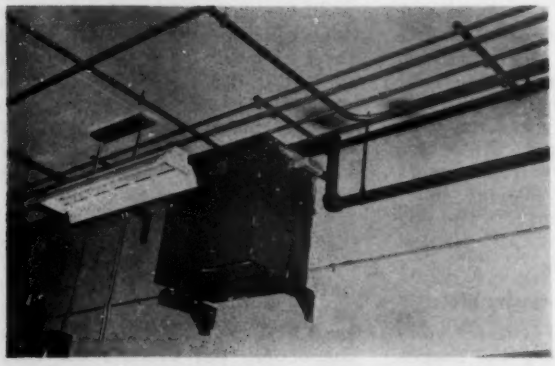
Another unit of magnetic panel for speed control of presses.

The main switch gear with three AK-150 units as main breakers.

Luminous ceiling under construction before plastic ceiling was hung below fixtures. Ceilings were all put up by electricians.



Luminous ceiling keeps most of the shadows and harsh reflections off the large amounts of shiny metal used in the composing room.



Over 20 dry transformers ranging from 5 to 225 kw are distributed throughout the building to transform 480 volts to conventional 115/230.

Rear view of the control panels with the magnetic panel at the left open. Well defined control points are located near all equipment.

the sustained vibration of the heavy presses. These wires have extra-heavy 3/64-inch insulation for added durability.

To avoid breaks in service and to aid maintenance, every foot of wire used in all feed circuits through the whole building, even those for lighting, is stranded, and all these connections are made with lugs. This also reduced the original cost of installation because of the labor-saving feature, especially on this big job.

All of the "control" wiring between the control room and the individual press-control stations was made with multi-conductor cables.

Extensive use was made of local sheet-metal construction for cable trays, enclosures, terminal cabinets, and special control cabinets throughout the plant. This custom work simplified the installation and secured exact fits for a beautifully-finished job.

Lighting in the 230-ft. long press room is provided by high-bay, color-improved 400-watt mercury vapor units on 25-ft. centers. These afford a higher intensity of illumination and some saving in current. The light-reflecting, aluminum-tinted ceiling is perforated and backed with insulating glass.

Glare-Free luminous ceiling

In the large editorial and composing rooms and in all offices, a total of 35,000 sq. ft. of luminous ceilings supply glare-free, even, and adequate lighting. All concealed fluorescent fixtures are individually fused so that only one unit can fail locally at any one time, and the whole room still remains well lighted. This is an unusual precaution in fluorescent lighting.

In these rooms the entire ceiling, in each case, was installed by electricians, and the "ceiling" is actually suspended two feet below the lighting fixtures. The plastic rolls back for easy replacement of lamps. These circuits are all in conduit with no metal tubing being used. Illumination is maintained at 70 footcandles except in proof-reading and teletype rooms where it is 100.

About 20,000 feet of underfloor duct serves individual desks with light, telephone, and "intercom" facilities. There are terminal boxes every five feet in the asphalt-tile floor to permit any change needed in future location of outlets. This assures three potential outlets every two feet. Dimming controls were also furnished in all the executive offices to soothe tired nerves in the "pinches."

Ample space was allowed in all switch rooms. The central air conditioning rooms are the only ones where equipment was a fairly tight fit, as they also house some of the dry-type transformers.

Emergency lighting is provided by a 40-kw diesel generator system.

The main switch gear is of the dead front type with three AK-150 units as main breakers. There are 85 individual circuit-breaker panels throughout the plant providing ample flexibility and local control.

(Continued on page 115)

Broad-area luminous ceiling

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers ✓

◆ THE INTERIOR ILLUMINATION of the Warren Petroleum Corporation building in Tulsa, Okla., is apparent from the exterior at night, since the translucent ceilings produce a series of rectangular blocks of light with a background pattern of cross hatching.

The lighting was designed by Skidmore, Owings and Merrill, architect-engineers, of Chicago. The lighting equipment was produced by the Wakefield Company, Vermilion, Ohio. It provides a type of broad-area illumination that approximates the quantity and quality of light from an all-luminous ceiling but with simpler maintenance.

Light is produced by continuous rows of units, each about 3′x5′x9″ deep, separated by rows of 24″ metal pans which snap into the supporting grid. There are 3,000 of these lighting units, suspended from yokes on special half-tee sections of the metal grid.

Each unit contains two 40WRS lamps with provisions for a third one where a higher level of illumination may be desirable in certain office areas.

The diffusers, which constitute about 60% of the ceiling area, swing down for maintenance. Laboratory tests made in advance of installation showed that the brightnesses were about equal whether vertical or parallel to the lamps. The brightness approaches the low brightness of a fully luminous ceiling.

Cross hatched effect adds interest to the exterior at night.

Though the camera picks out the difference in brightness values, the metal dividers are actually hardly noticeable to the eye.

Contractors emphasize convenience to customers—one setting on this sprinkler control solves lawn or farm irrigation problems for a year!

Cyril J. White, president of Tork Time Controls, Inc., compares earlier model hand-wound switch with a portable plug-in control for room air-conditioners.

Contractors sell time switch convenience and efficiency for added profit

By Dorset J. White

Director of Sales
Tork Time Controls, Inc.
Mount Vernon, N. Y.

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers ✔
- Consulting Engineers ✔

◆ MOST BUSINESS FIRMS know little about the value of time switch installations. They don't know how much they can save, in electricity, equipment, and labor costs, through the use of time switches. The electrical contractor need only show a firm the savings that can be achieved, and he will rack up both a sale and an installation. Time switches offer the contractor an excellent opportunity for creative selling—and added profits.

Take air conditioning, for example. An air conditioner makes a store comfortable for employees and customers—but it does take time to cool the store. A time switch, however, will turn the conditioner ON before the store opens; at opening time—comfort is there. No need to waste manpower by bringing an employee in early—the time switch does the job.

Nor is there any danger of forgetting to turn the conditioner OFF at night—the time switch has a built-in memory. For stores with a changing daily schedule of opening and closing hours, there's a 7-day dial for scheduling an entire week's program—to insure air conditioning being ON when needed and OFF when not needed.

Yes, time switches have come a long way since 1923—the year Tork first mass produced units for the control of store window display lights. Lighting control is still a major application for time switches, but many contractors are not aware of all the types of switches and dials now available.

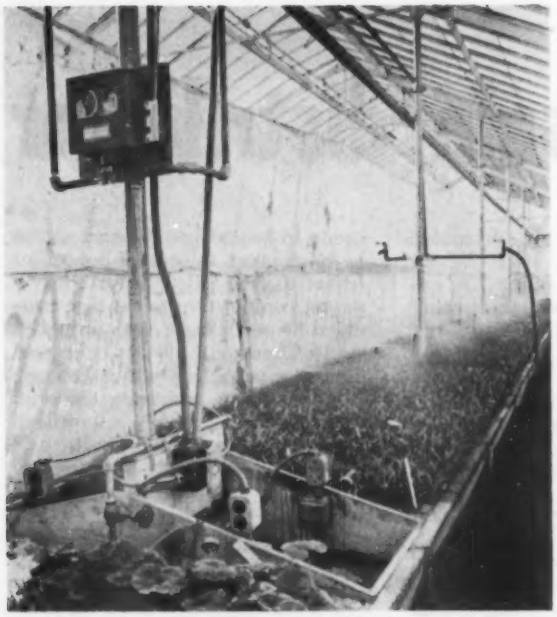
For control of maximum loads, one can use a 3-pole time switch . . . and time switches today may handle up to 55-amperes per pole. The 3-pole units usually eliminate the need for the installation of a contactor, saving money on the job.

And, perfect for building and factory lighting control are the 2-circuit time switches. Install but one of these and yet control two individual circuits—another time and money saver for the contractor in unit cost and installation.

Outdoor lighting applications

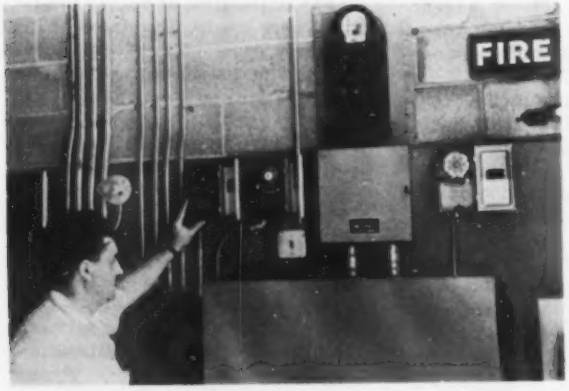
While stores know of the value of time switches for the control of window display lights—many have failed to use them for their outdoor and overhead signs. Since they're pre-sold on time switches, it's a natural step for the contractor to suggest—and—sell units for control of their sign lighting. And, the growth of neon sign spectaculars and outdoor billboards has created a great market for con-

(Continued on page 118)



Tork's twin-dial mist control is at work in this greenhouse. A few seconds of mist each minute is considered the optimum method of root propagation.

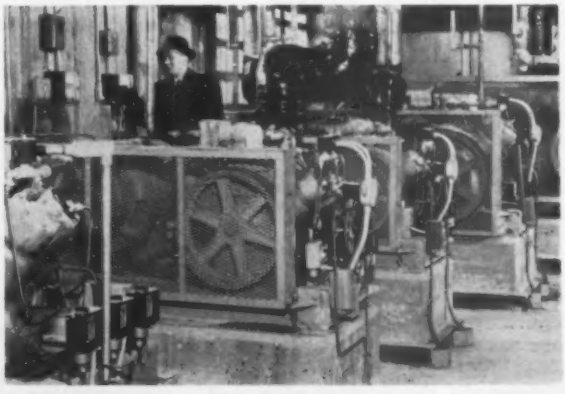
Nurseryman displays prize carnations bred under mist-propagation method. Other controls are available to "prolong" daylight needed for growing plants.



Here four time switches control window and store display lights, heating and air conditioning systems.

Time switches control building lights and eliminate forgetting to turn hall safety lights ON and OFF.

At left, contractor examines the Hourmaster time switch which controls the deep-freeze compressor room shown at right.



Three compressors control five deep-freeze rooms and two time switches control the three compressors in a metropolitan hospital.

The wholesale distributor

By Dr. Edwin H. Lewis

Professor of Marketing
School of Business Administration
University of Minnesota

This article should be especially helpful to the following readers:

Electrical Contractors ✔
Electric Utilities ✔
Electrical Wholesalers ✔
Electrical Inspectors
Industrial Engineers
Consulting Engineers

◆ THE ADVANTAGE of an outsider taking a look at an industry like this is that he isn't handicapped by any previous knowledge of industry problems, and, therefore, can take a reasonably objective view of the industry and the methods of doing business. He also sees some things which it is often difficult for people who have spent their working lives in the business to see: namely, that changes are occurring in the industry and that these changes result from basic forces which inevitably will have certain effects.

Unlike some other parts of the world, our methods of marketing in the U. S. are subject to continual change. We take pride in our dynamic economic system, in our aggressive sales promotion methods, in our goal of improving the efficiency of doing a job, whatever that job may be. Whenever improvements are made in some part of the business field we are likely to think the net result is good. However, when we are adversely affected by changes in our own industry the result—to us—is bad, and we complain about certain practices or become annoyed with other organizations in the industry.

Basic marketing goals

A brief explanation should make the *basic* marketing goals clear. There are certain jobs to be done in the marketing of electrical equipment and supplies, as in other products. Goods must be moved physically to the point where they are needed. They must be stored at convenient locations *until* they are needed. They must be promoted and sold, and they must be financed. Frequently, sellers are expected to make available other services of a technical or advisory nature.

The other side of the coin, and the side of greatest interest to you, involves the question, Who should perform these jobs? Our economic system—based on free enterprise—has the answer to that question. *He who does a given job best will perform it.*

All of the jobs which I mentioned a moment ago can be handled by various people who are engaged in the marketing of electrical apparatus and supplies.

Several alternative channels are available: manufacturer—distributor—user; manufacturer—agent—distributor—user; manufacturer—agent — user; manufacturer—user.

Each of these channels is in competition with the others, although not for all types of electrical products. Since the marketing of electrical apparatus and supplies is essentially a wholesaling function, this function may be performed by the manufacturer, the agent, or the distributor; or it may be split in some manner among them.

Threats to wholesaler

The established electrical distributor has viewed with alarm several competitive developments which appear to threaten his position in the industry. Among these are (1) the growth of manufacturer's branch or field warehouse stocks; (2) the growth of stocks carried by agents and, in fact, sometimes purchased by agents; (3) the appearance of limited-service distributors, or as they are generally called "brokers", who sell over a wide market at low prices; (4) the intense downward pressure on prices — particularly for construction materials — which exists in many markets; (5) the threat that manufacturers and their representatives will sell directly to contractors.

In the light of these developments, the electrical distributor needs to reexamine his own status in the market. In several important respects, the distributor has a strong competitive advantage provided he performs his job properly.

(1) There will always be a need for an organization which can sell to contractors and industrials in comparatively small quantities. Somebody must break bulk, and the full-service wholesaler frequently is in the best position to do it.

(2) Contractors and industrials generally want immediate delivery—at least on standard merchandise—and this creates a need for adequate local stocks. If the distributor performs the stocking function in the way that he should, he can give this service.

(3) Contractors, and some industrials, need credit. By virtue of his intimate knowledge of the local market, the distributor is in an excellent position to extend the necessary credit.

(4) Buyers frequently need technical information and advice about a product and its uses. Again, a good distributor can perform this service.

These are major services which the distributor who really is doing his job can make available to customers. And these are the services which, historically, distributors have given. There is no evidence whatever to indicate that the need for this type of service is declining. On the contrary, when other organizations attempt to perform these services they are frequently handicapped in one way or another.

Since manufacturers and agents have comparatively few lines (with the exception of some of the largest manufacturers) the marketing costs which they incur must be charged against these lines. This becomes a major consideration when manufacturers sell direct to users. Only when large dollar margins are available on the individual sale can the manufacturer undertake this activity profitably.

Reasons for failure

Having indicated the conditions favorable to the distributor, and which underlie successful distribu-

in perspective

This article contains excerpts from an address by Dr. Lewis to the 50th Anniversary Convention of the National Association of Electrical Distributors, San Francisco, California, June, 1958. Dr. Lewis recently completed a comprehensive study of the distribution of electrical apparatus and supplies.

torship operations, let us consider another list of factors which spell trouble for the distributor when very many of them are present. These include:

(1) The failure on the part of the distributor to carry stocks adequate to meet the needs of his customers. It is this situation which opens the door to manufacturers' and agents' field stocks. The distributor cannot shirk his responsibility in this respect and then blame the manufacturer for setting up competing stocks.

(2) The tendency for the distributor to spread himself too thin by attempting to handle too many competing lines. By trying to be ready for *all* possible demands, he is unable to do much more than handle routine orders for any.

(3) The practice of giving liberal credit to all comers, and thereby trusting to luck that he will get paid. By relying on the dubious belief that the financially irresponsible contractor, who is in debt to every other distributor in town, will pay promptly, the distributor risks his own credit standing.

(4) The failure to do an effective job of sales promotion and an unwillingness to work with manufacturers who offer to assist in improving selling methods.

(5) The failure to seek out new markets and new types of business which might be profitably handled. This includes new areas which may require establishing a branch and also new types of customers and new kinds of business.

(6) Following a practice of getting volume as the major company objective. This results from the mistaken belief that volume is the factor of primary importance. It also results from a lack of knowledge of costs and, consequently, a failure to identify and separate profitable from unprofitable business.

(7) Attempting to meet dubious forms of competition by "beating them at their own game." This cannot be done, and is a futile approach in any case. Take the brokerage type of operation, for example, the typical full-service distributor cannot copy this method of doing business, and he should not try. If an operation of this type is unsound, it will fail of its own accord. If it happens to be successful, it means that some buyers believe it is profitable to purchase certain items this way—and this may be true. As a result, the full-service distributor may be forced, in time, to change his product mix and to put greater emphasis both on service and on product lines which brokers cannot handle.

To each his own

"To each his own" is a phrase which applies to an increasing extent in the electrical goods market. The range of products has grown so complex and the different types of markets and users so numerous that there is room in this field for many different types of operations. The scope of operation of any two firms, even in the same area, need not and in fact should not be the same.

Under present market conditions, greater profits are likely to lie in the direction of greater specialization. I have talked with several distributors who have been able to find profitable areas of specialization either by carrying a very complete line of certain types of products, or by meeting the specialized needs of certain types of customers, or both.

All told, the financial rewards will go, to an increasing extent, to the distributor who properly analyzes his market, who knows his costs, and who finds the segment of the business in which he can perform a unique service.

It is quite apparent that the pressures which have been present in the market during recent years —and I'm talking about the longer run factors not the current recession—are going to continue. The comparatively easy market conditions of the early post-war years are gone and, short of another war, are not likely to return.

The potential output of the electrical apparatus and supplies industry is tremendous. Even in a market which is expanding with growing population and a higher standard of living, the supply of goods produced will constitute a steady pressure on the market.

Possible market trends

This need for markets, in order to absorb the steady flow of output, will have several results:

(1) It is quite possible that new types of middlemen will appear who will perform a limited range of functions. In addition to the brokerage type of operation, some agents are taking title to lines which they are representing and may evolve into a form of semi-wholesaler. Several kinds of specialization by type of product and market have already occurred, and others are likely to appear. Both established distributors and new enterprises seeking additional business will be led to experiment with a different product mix and a different customer emphasis. This will be particularly true in the larger cities where greater opportunities for specialization exist.

(2) As new middlemen evolve, new channels may appear—for example, agents who take title may be expected to increase the amount of sales which they make directly to users.

(3) Manufacturers who are not able to get distribution through established distributors in certain areas, because distributors already have an adequate selection of lines, will attempt to sell direct to users and will bring pressure on their salesmen and agents to do so. Such manufacturers, therefore, will come into direct competition with distributors.

(4) The distributor will be faced with some difficult product decisions. One alternative will be to handle more lines and try to do a selling job for all. The other will be to hold the number of brands in each product group to a reasonable minimum and refuse to be-

(Continued on page 120)

Jobber says duty to contractors

By Harry J. Miller

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors
- Industrial Engineers ✔
- Consulting Engineers

◆ THE WHOLESALER is remiss in his duty who makes no attempt to guide, counsel, advise—even warn—his customer, the electrical contractor, from knowledge born of his jobber experience.

That is the unshakable conviction of electrical wholesaler Joseph Brockman, owner of Brockman Electric Supply Company, Sarasota, Fla., who maintains that the jobber's business can only be as good and as strong as his customer-contractor's.

Commented Brockman: "What's good for him is good for us. If the contractor makes a profit, the jobber will survive. Wholesalers cannot exist without a following of responsible contractors who know their own business!"

Jobber's responsibility

"The jobber should sit down and break bread with his customers," urged Brockman. "He should accept every opportunity to meet with and help them solve problems. These may involve consideration of credit extension for king-size contracts they've been awarded and cannot swing with their own financial resources. Or they may need counseling on the purchase of expensive tools or new trucks for their businesses. Or they may need counseling on how to do a better selling job, at least equal to the plumbing contractor's efforts."

Like other wholesalers of his stature, Brockman performs the essential functions of a jobber which include studying trade territory needs; selecting lines and items from many manufacturers, best suited to the needs of contractors in his area; buying in quantities which effect distribution savings for the wiremen; warehousing goods that will be available as needed by his customers; furnishing authoritative information on merchandise and price changes through trained salesmen who contact contractors; delivering merchandise, when ordered; extending credit where it is justified; and, in many cases, furnishing merchandising ideas and sales promotion assistance.

Heavy stock maintenance

As one of the largest suppliers in this area, with branches in St. Petersburg and Fort Myers, Brockman maintains a stock of electrical supplies verging on a third of a million dollars. So that contractors in outlying areas may be rendered fast service, the Sarasota office is equipped with Western Union teletype machines whose counterparts are maintained in the other two supply houses. Thus, instant three-way communication enables rapid locating of any requested item at the trio of offices. In a matter of minutes the item is made ready for shipment.

"We feel that our greatest strength and assistance to contractors stems from a broad inventory," Brockman said.

This he counts as primary importance in wholesaling, since its function is somewhat proportionate to the distances involved, as between the supply house and its customers. Obviously, the jobber serving a compact local area might deal directly with most contractors. But as he widens his market, there may be a progressive loss of efficiency, with a progressive increase in expense necessary to reach fringe-area contractors. Brockman feels his immense stock serves as a bulwark against delayed deliveries or supply exhaustion of items that hold up a contractor's job.

Primary education needed

The help Brockman extends to contractors often indicates the need for further education among beginning contractors.

"For example," he said, "these fellows often give established contractors a bad time. Seven experienced contractors had bid $1,800 on a job. One man bid $1,000." The seven sought Brockman as an intermediary. There couldn't be that much difference in price, they argued, and would he explain their views to the $1000-man? They offered to open their books to show him they felt the under-bidder had made a mistake in compiling figures.

Brockman would, and did. All he received in return, was a flow of profanity for his effort. "There just couldn't be that much differential in all the bidding against you," Brockman told the man. The contractor stalked out. Next day he returned, sheepishly announcing he'd gotten the customer to pay $350 more.

"The fellow worked for nothing, because he just didn't know how to bid," said Brockman.

He continued:

"It is the duty and privilege of the wholesaler to hand out facts of life to beginners, and to established contractors, too, who feel they need the wholesaler's advice.

"Take the plumbing contractors. They invariably seek to upgrade a sale. If the customer wants inexpensive white fixtures, they try to sell him on color.

Combat misinformation

"On the other hand, if one electrical contractor figures on a $450 housewiring job with the idea of installing a heavy service for future expansion, another embryo wireman may seek the job by telling the customer that he doesn't need such a heavy service, and that he can save the customer $90," Brockman explained.

"We try to convince our customers" he said, "they'd show better business sense by bidding $485. In that way, they can do work which will save the customer future headaches when the latter install heavy appliances. Thus, the contractor establishes a reputation for reliability. In a small town like Sarasota, this is of paramount importance to the contractor who expects to put his children through college on the returns from his

involves day-to-day counseling

electrical contracting business."

Brockman continued:

"We preach that the contractor needs to do a more aggressive selling job. Take a profitable item like the electronic door opener. The average contractor shies away from such specialty items. We had two left out of six over a long period of time. The electrical contractor's field is to sell merchandise which he also installs. When they failed to push it, we were forced to relinquish the garage gimmick. It then became a factory-to-customer deal via personal factory representation."

When it comes to compiling bids, too many contractors do so with price as their primary consideration.

"Yet, they expect the jobber to furnish both price and quality, since he handles top lines," Brockman pointed out.

The Sarasota jobber is adamant in his belief that when an applicant seeks credit, the latter should reveal the customer's name for whom he seeks the jobber materials. Brockman's notion is that just as a bank or other lending agency wants to know where its money is going, so does the jobber, both for his own protection and that of his contractor-customer.

Said Brockman:

"Like other wholesalers, we have access to credit information which we can pass along and save the contractor damaging loss. But he should learn to put his cards on the table. The jobber can explain simple facts of bank credit and the wisdom of borrowing there in order to save far more money by discounting bills."

Perhaps one of the most urgent educational needs the contractor can learn from the jobber is the wisdom of adhering closely to the 90 day lien law and demanding draws from the general contractor at the stated times.

"The average small contractor shudders at the thought of paying bank interest, so it is incumbent upon the jobber to explain the simple mathematics of paying $60 for a year's use of $1000 and dis-

(Continued on page 119)

Today's jobber should sit down and "break bread" with his contractor customers, accepting every opportunity to help them solve problems, in the opinion of Joe Brockman, of Brockman Electric Supply Co., Sarasota, Fla. Brockman, above left, confers with a contractor customer.

One of the area's largest electrical suppliers, with branches in St. Petersburg and Fort Myers, Brockman equips his three offices with these modern teletype machines to speed-up all phases of customer service.

Texas man new NAED president

The new president of NAED, John Hamblen, has been active in the organization since 1938. He was elected at the June convention.

By Baron Creager

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ PRACTICALLY everyone in Houston calls him "Jake," but the full name of the new president of the National Association of Electrical Distributors is John Paschal Hamblen.

He is a big, friendly, native-born Texan who gets things done in a sort of deceptive calm way. That is, he doesn't seem to be moving very fast when he moves, doesn't leave the impression of a dynamic driver. He speaks with ease, and he gets things done.

By request, he was enumerating some of his past and present activities in behalf of his alma mater, Texas Agricultural and Mechanical College: past president of the Former Students Association, past chairman of the athletic council, past chairman of the development fund board, president of the Aggie Club.

These, and his size, would suggest an athletic career as colorful as the spectrum. He is six feet four, weighs 210, looks as though he was big enough in his under-graduate days, in the early 1920's, for tackle, or maybe end. So he was asked, "Did you play tackle?"

"Coach Dana X. Bible took one look at me," Hamblen answered, "and said I'd make a fine team manager. I played football in high school, but when I got to A. & M., I was the height I am now and weighed 160 pounds. So I managed the team for two seasons and went out for track and tennis."

How he graduated as a textile engineer, accidentally wandered into the electrical field, with his partner eventually bought Southern Electric Supply Company and its $4,600 inventory with $7,500 of borrowed money, and built it to a solid institution doing an annual volume of ten million dollars is another part of the story. Of more acute concern to Hamblen is the chapter to be written in the year or so immediately ahead. He is concerned that people in the electrical supply business will be too loose with their credit.

"The construction industry is the life blood of our business, naturally," he said, "and although we have gone through a leveling off period, I believe we will see the end of that with the end of the year.

"All of us have to do business more efficiently. My greatest fear for the electrical distributor is that there will be an overextension of unjustified credit.

"For both distributors and contractors the next year—from the financial viewpoint—will be one of the most trying. There are a lot of new people in the business who are not yet anchored. Some have bought ranches and yachts and such things and have thus taken needed capital out of the business.

"It is a highly competitive business, looking at it from all angles, because there is a tremendous supply and a limited demand."

Hamblen paused, opened the middle drawer of his big desk and produced a current financial statement. Opposite the line reading, "Notes owed at banks," there was a obvious absence of figures. This was no boastful gesture. If you know Hamblen, you know he did this to show that he practices what he preaches. Speaking as a distributor and not as president of NAED, he continued:

"The Southern Electrical Supply Company thinks it is unfair to give one set of terms to one group and another set of terms to another group. Terms and prices go hand in hand."

For the overall future of the industry, Hamblen has no apprehensions.

"Our growth as an industry is mostly ahead of us," he said. "We are only 50-years-old. It is a tremendous challenge. I have no fear of the future."

Perhaps the closest thing to Hamblen's heart at this writing is a meeting scheduled for the Edgewater Gulf Hotel in Edgewater Park, Miss., for October 12-15.

"Last year Houston had the zone 8 meeting of NAED," he recalled.

(Continued on page 117)

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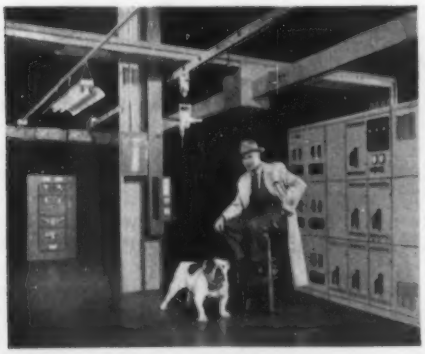

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Maintaining industrial electronic apparatus

By George C. Skinner

Static Control Engineer
Westinghouse Electric Corp.

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electric Utilities ✔
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers ✔
- Consulting Engineers

◆ MODERN industrial electronic apparatus normally makes use of higher quality and more conservatively rated components than are found in radio-television manufacture. Better insulation and greater voltage clearances are used. Also, because of the more serious effects of trouble, which can result in costly scrap material and loss of production, the plug-in sub-assembly type of construction is widely used. In case of trouble, spare sub-assemblies can be plugged in, and the defective assembly repaired later. This also means that the trouble shooting can be done at a location where all the instruments and set ups such as described further on can be kept ready for use.

Preventive maintenance of electronic equipment is therefore generally a case of an occasional sight inspection for build-up of conductive dust or condition of relay contacts. Maintenance servicing (or repair) is the most vital function of the electronic maintenance man. In this article checking of basic units will be fully explored for the maintenance man.

Maintenance servicing of industrial electronic apparatus requires a basic knowledge of thyratrons and ignitrons. Thyratrons are grid controlled, gas filled rectifiers; ignitrons are mercury pool rectifiers.

The thyratrons are generally used in the control portion of the circuit and initiate the ignitrons which are capable of passing hundreds of amperes of current. Since an ignitron is inherently a half wave rectifier, two of them are used in an anode to cathode connection called a "back to back" connection to pass alternating current.

Necessary maintenance tools

More circuit testing can be done with an ordinary volt-ohm meter, but occasionally an oscilloscope will be necessary. Also needed is an ignitron and thyratron gas tester. While a standard gas tester can be purchased from Westinghouse, a substitute can be made from a neon sign transformer or an oil burner ignitron transformer with an open circuit secondary voltage of 10 to 15 KV, a primary voltage of 115 volts, 60 cycles, and a secondary short circuit current of 20 to 60 milliamperes.

Calibrating the oscilloscope

The oscilloscope may be calibrated to read either RMS or peak voltages. To calibrate for RMS voltage, a voltage of approximately the same magnitude as the one to be measured is applied to the input terminals of the oscilloscope, and the sweep is adjusted to one or two cycles and synchronized with the line.

The various taps on transformers offer a wide range of voltages with which to calibrate the oscilloscope. For example, assume the voltage to be tested is around 100 volts RMS. Connect the oscilloscope input to terminals which are known to be 120 volts. The pattern

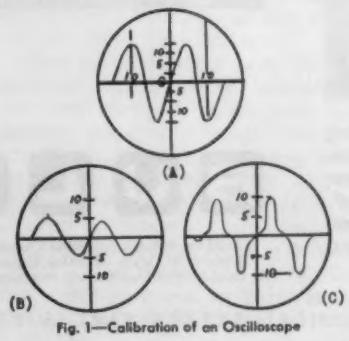

Fig. 1—Calibration of an Oscilloscope

on the oscilloscope screen is adjusted as in Fig. 1A. Leaving the vertical gain control set in exactly this position, connect the terminals of the oscilloscope to the test voltage. The calibration is now 10 volts RMS per division (+ and —) deflection. Thus an applied voltage which gives a pattern as shown in Fig. 1B is 50 volts RMS. The sweep frequency and the horizontal amplitude may be changed without effect on the vertical calibration.

It is frequently desirable to be able to read instantaneous values of voltage on the oscilloscope. To make such readings, follow a procedure similar to the RMS calibration, except use peak values on the applied voltage. The peak value of a sine wave is 1.41 times the RMS value. For example, apply 115 volts RMS; the peak value of 115 volts will be $115 \times 1.41 = 162$ volts. The image on the screen of the oscilloscope is then adjusted to plus or minus 16.2 division, and the screen is direct reading in instantaneous values. If the output voltage of a peaking transformer is now applied to the oscilloscope, and the image obtained is as shown in Fig. 1C, the peak value of the transformer is 100 volts.

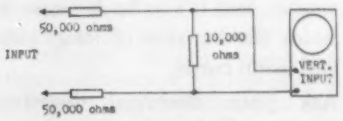

Fig. 2—Voltage Divider for Oscilloscope

Since the maximum rated input voltage for many oscilloscopes is 250 volts or less, some type of voltage divider is required for the higher voltages. The diagram of an appropriate divider is shown in Fig. 2.

To measure phase angle, the oscilloscope is set with a 60 cycle sweep frequency which is synchronized with the line. This voltage must not be changed during the test. Instructions on how to do this may be found in the oscilloscope manufacturer's instruction book. Note, however, that synchronization with the vertical input of the oscilloscope is not suitable. Some voltage must be chosen as a reference, and its image on the screen of the oscilloscope adjusted to a suitable amplitude. It can then be traced on the oscilloscope screen with ink or a soft wax crayon as shown in Fig. 3A.

The line voltage is usually selected as the reference voltage, and one of the oscilloscope leads should be marked as a reference lead

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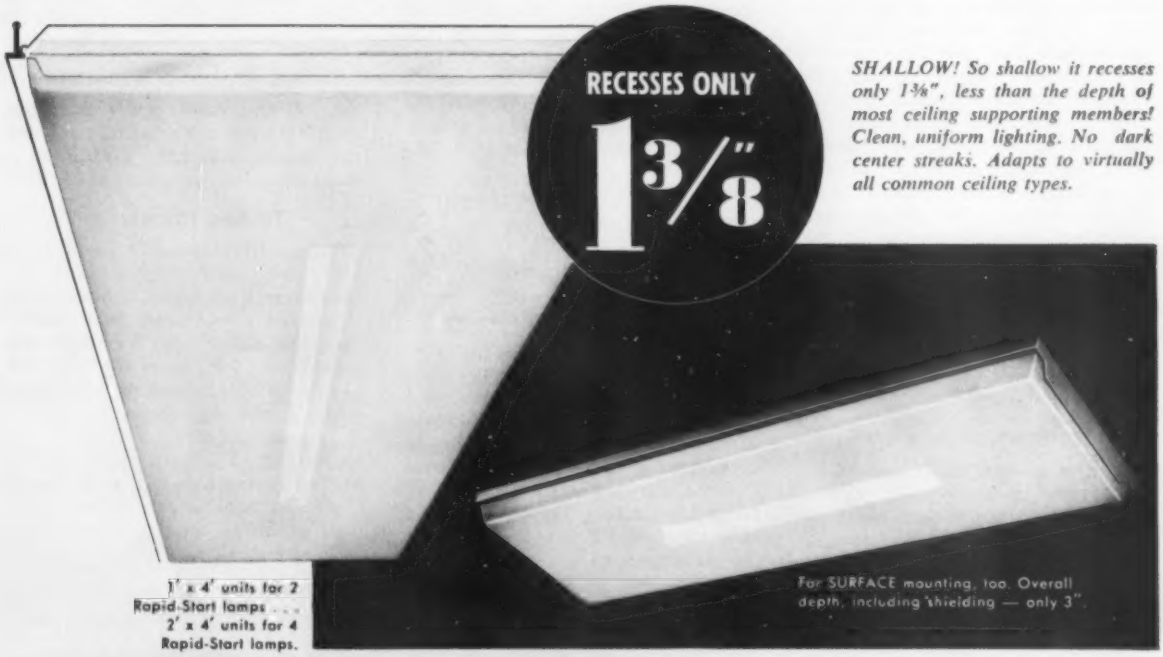
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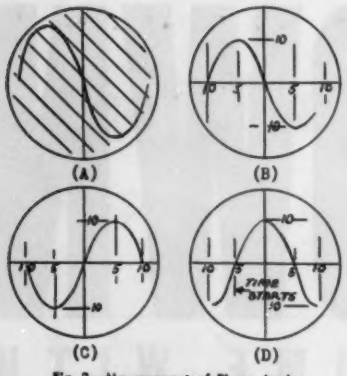


Fig. 3—Measurement of Phase Angle with an Oscilloscope

when the voltage is applied to the oscilloscope. The unknown voltage is then applied to the oscilloscope and the phase determined from the position of the image. During this test only the vertical gain control can be varied without upsetting the test. For example, assume that the image previously shown has been obtained by connecting the input to the line and that the reference oscilloscope lead was connected to one particular side of the line. The image of a voltage that is in phase with the line will be as shown in Fig. 3B. If the leads are turned over, the image so shown in Fig. 3C will appear and is said to be 180 degrees out of phase when compared with the phase of the line. Place the oscilloscope leads across the load and vary the heat control potentiometer to some intermediate point. The picture will be similar to Fig. 3D and will shift horizontally as the heat potentiometer is varied.

Testing transformers

To ground test all transformers connect as shown in Fig. 4 and touch the test lead to each winding, if the bulb lights, the transformer

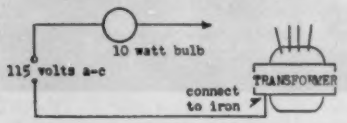


Fig. 4—Ground Test for Transformer

is defective. For control transformers, other than peaking or impulse transformer, check for shorted windings or short circuited leads by connecting the suspected transformer as shown in Fig. 5. Remove the loads one at a time until the

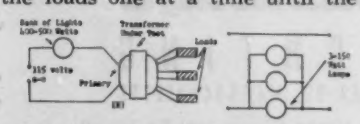


Fig. 5—Test for Shorted Windings on Transformers

light bulbs are extinguished. The load, whose removal darkens the lights, is defective. Replace defective part or remove short circuit. If the removal of all the secondary loads does not darken the light bulb, the transformer is shorted. To test for open circuited windings, apply rated voltage to the primary of the transformer, if the measured secondary voltage does not agree with ±10% with the value given on the schematic diagram, the transformer is defective. NOTE: An a-c voltmeter with a sensitivity of at least 500 ohms per volt should be used.

Testing capacitors

In checking capacitors, all except mica grid capacitors should be removed from the circuit. Measure capacitance on a capacitance bridge if one is available. This will detect either open or shorted capacitors. Measure the resistance of a capacitor with an ohmmeter. If the capacitor is shorted, the meter will indicate less than 10 ohms. If it is good the resistance will be 50 megohms or greater.

To check for an open circuited capacitor, connect as shown in Fig. 6. If neon tester does not glow, the

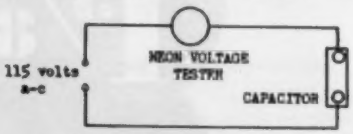


Fig. 6—Open Circuit Test for Capacitors

capacitor is defective. This test does not apply to mica grid capacitors. Resistance between terminals, and between terminals and case, measured with a megohm meter, should be at least 50 megohms. In the case of mica grid capacitors check either on a capacitance bridge or try a new capacitor. For a short circuit test of a mica grid capacitor leave the capacitor on the tube socket, remove the external grid lead and measure the resistance with an ohmmeter. It should show at least 100 megohms.

Testing small control tubes

Small control tubes such as types WL-2050 and 6X5 may be tested with a commercial tube tester, if no tester is available, try a new tube. If a tube fails frequently, the load may be shorted, the grid resistor may be shorted, the grid may be shorted to other elements at the tube socket or the filament voltage may be too high or too low. Rated filament voltage (6.3 volts a-c ± 5% for WL-2050 and 6X5)

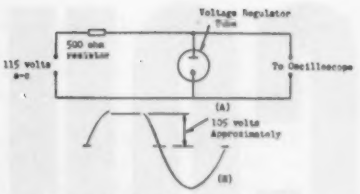


Fig. 7—Test of Voltage Regulator Tube

should be measured at the tube socket. Voltage regulator tubes type VR-105-30 are usually good if the tube glows when voltage is applied to the control. To check a VR tube calibrate the oscilloscope as previously explained and connect as shown in Fig. 7A. The wave form on the oscilloscope should be as shown in Fig. 7B.

If no oscilloscope is available, connect as shown in Fig. 8 and adust resistor for ammeter A to a reading of 0.030 ampere direct cur-

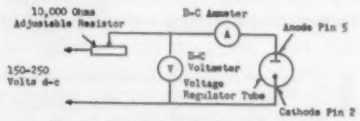


Fig. 8—Test of Voltage Regulator Tube

rent. If the voltmeter V does not read between 101 and 109 volts d-c the tube is defective. Voltmeter V must have an accuracy of ± 1%

Testing thyratrons

Large thyratrons can be checked for being gassy by removing the tube from the control and allowing it to cool for at least 30 minutes. Test the tube in a Westinghouse tube tester for gas, if the tester is not available, mount vertically with anode up and connect as shown in Fig. 9.

Important: Filament must not be heated during this test. If the lamp glows the tube is gassy and a new tube should be tried. If a tube fails

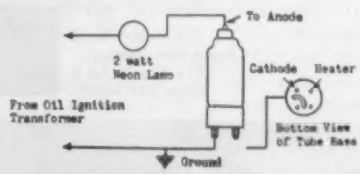
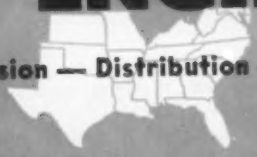


Fig. 9—Gas Test for Thyratron Tube

frequently, the grid resistor is shorted, the grid is shorted to another element at the tube socket or the filament voltage is too high or low. Rated filament voltage (5.0 volts ± 5% for WL-672) should be measured at tube socket.

(This discussion of industrial electronic apparatus maintenance will be continued in the next issue of Electrical South.)

UTILITY ENGINEERING



Transmission — Distribution — Metering

Design
Installation

Testing
Maintenance

MODERN TRENDS IN METERING—A resume of equipment and operating methods of one of the most modern meter departments in the South.
(See next page)

Modern trends and practices

By S. B. Vaughn
Supervisor Meter Department
Florida Power Corporation
St. Petersburg, Florida

◆ TWO YEARS have elapsed since we moved into our modern Meter Department building, in St. Petersburg. During that period the increase in meters has followed the curve which was estimated at the time of planning the new building. During 1957 our single-phase meters in service increased 7.3 per cent and our three-phase meters in service increased 12.2 per cent.

The Florida Railroad & Utility Commission requires us to test single-phase, self-contained meters every 96 months; three-phase, less than 250 kva, and single-phase with instrument transformers every 24 months; and three-phase in excess of 250 kva every 12 months.

In order to maintain our test schedule, approximately 1/8th of all single-phase meters in service are changed and tested each year. All of these meters are returned to our central shop, and all tests are made on our modern equipment (see Figure 1). Each of the 35 districts is assigned a yearly quota of meters to be changed for test and instructed to change 1/12th of them each month.

The meters are changed by district personnel and usually are changed to coincide with reading dates. The Billing Department assigns space on the meter reading sheet for the date each meter is due for test, and service orders for the changes are made from the meter books and properly routed. This makes an even flow of meters through our shop and requires a minimum number of meters in stock. In fact, during the last ten years we have been able to decrease our stock of meters from 8 per cent to 3.5 per cent.

Meters returned to the shop are recorded by company number and meter reading by use of a standard 10-bank adding machine. This was formerly written by hand. Using the adding machine decreases mistakes, and the amount of time consumed is cut in half. (see Figure 2).

The old meter cover is replaced by a clean one, and the meter is placed on the conveyor for delivery to the test room. From the test room where the meter is recalibrated and sealed, it is carried on the conveyor to the warehouse for packaging and reshipment to some district. A total of 62,292 single-phase meters was tested in our shop during 1957.

Walk-in type delivery truck

A standard, flat-back delivery body truck of the walk-in type with provisions to hold 120 meters is used for changing single-phase meters for test in the St. Petersburg district. The operator of this truck works through the rear door, thereby eliminating the hazard of stepping into traffic. He always has the correct meter available for change without searching for it. Standard 3/4" plywood was used to make the meter holders (see Figure 3).

In 1957 we tested 2,681 polyphase meters in our shop. Increased usage of these types of meters plus the fact that "S"-type polyphase meters are removed and returned to the shop for test made it neces-

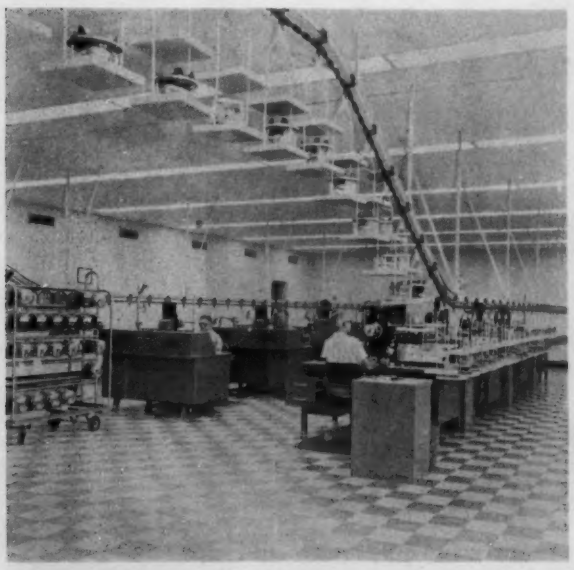


Fig. 1—Meters are placed on the conveyor for delivery to test room. From there, after they are recalibrated and sealed, they go to the warehouse.

Fig. 2—Meters returned to the shop are recorded by number and meter reading on a standard 10-bank adding machine. This was formerly written by hand.

in meter department operations

sary to increase our shop production. After carefully evaluating all of the equipment on the market, a duplex, automatic meter test panel was purchased and placed in operation in April, 1958 (see Figure 4).

This panel has two test positions which will operate independently of each other or will operate simultaneously. The panel is designed for testing 120-volt, two-wire and 240-volt, or three-wire single-phase meters and 1, 2, or 3 element meters of 120-240 volts. Phantom load for currents FL 2.5, 5, 10, 15, 25, 30, and 50 amperes and LL 0.25, 0.5, 1, 1.5, 2.5, 3, and 5 amperes with selector switches which simultaneously select FL and LL currents such as 2.5 and 0.25, 50 and 5 amperes, etc., is provided.

The panel is equipped with two photoelectric revolution counters. Each test position is equipped with a photoelectric pick-up, which is operated by reflected, general illumination from the disks of the meters under test. The illumination should be of about 75 foot-candles intensity from directly over the meter disks and should override any light coming to the disks from other directions. This is to prevent any shadowing of side light, which might cause the pick-up relay to operate inadvertently.

Motor-driven reset device

Six watthour standard meters are required and are mounted at the rear center, so as to be viewed through a mirror over them. A light source is provided to light the standard dials which appear in mirror image, and reverse printed dials are used which cause the image to appear straight up. A motor-driven reset device is provided to reset the standards to zero after a run has been made.

Two of the six standards are associated with "Full Load" runs (100% rating, 100% power factor); two are associated with "Power Factor" runs 100% rating, 50% P. F.); and two are associated with "Light Load" runs (10% rating, 100% P. F.). They are the left-hand, middle, and right-hand positions, respectively. The top three are for the right-hand test positions, and the lower three are for the left-hand position.

The photoelectric relay counts revolutions and, in cooperation with the manual controls, connects the proper load and standard with the selected individual run, or causes the "FL-LL" runs or the "FL-PF-LL" runs to be made automatically in sequence as selected.

In operation, the meters under test are placed in the test mountings and connections made as required. The pick-up arms are adjusted so that the end of the pick-up snouts are over the edge of the disks and so that passing of the "black spot" shuts off light to the snout. The pick-up sensitivity controls are adjusted so that the relay registers properly; the current rating is selected, the voltage switch position is selected; the 3-wire, 2-wire, or polyphase element selection made; and the panel energized. The meter will run at "full load" under the connections selected unless the PF or LL individual runs have been selected; in which case, the meter will run at these loads.

A run is started by operating the "start" key to the start position and then releasing it. First, the motor driven reset is energized, and the panel remains inoperative until the resetting operation is completed. The proper standard is then energized on the next impulse from the pick-up. The number of revolutions for each run may be selected by the switches provided. After the selected number of revolutions have been counted by the counting mechanism, either the next sequential run commences, or if only an individual run has been selected, the mechanism automatically resets to the starting state, ready for initiation of the next run.

Resetting during a run

This automatic resetting also takes place after an automatic sequence of runs selected has been completed. If something should go wrong during any run, it is not necessary to await the end of the run and the automatic reset—the mechanism may be reset at any time by pushing the same key used to start a run to the "stop" position.

When a run is completed, the positions of the standards pointers

Fig. 3—A standard, flat-back delivery body truck of the walk-in type with provisions to hold 120 meters is used in the St. Petersburg district for changing single-phase meters for test.

are preserved, so that they may be read. They are not reset to zero until the next desired run is initiated.

There are provisions for a 1500-volt breakdown insulation test on the meter while it is in the regular test position on each panel.

During the short period that this panel has been in operation we have been able to increase our meter tests approximately 100 per cent without any extra effort on the part of the operator. With additional experience, we expect an even greater increase.

Increase of services using instrument transformer necessitated the purchase of testing equipment capable of testing current transformers from 5 to 5000 amperes and potential transformers from 120 volts, to 14,400 volts. Potential transformers above this range used for customer metering are purchased with a test certificate.

The instrument transformer testing equipment used consists of three units: (1) a potential transformer tester, (2) a current transformer tester, and (3) a detector wattmeter. The detector wattmeter is a precision instrument capable of measuring watts with very low values of current or voltage. This wattmeter is used with each tester. It is also possible to use a Silsbee set with this equipment, but our experience has indicated to us that the detector wattmeter method is much faster.

The potential transformer testing equipment consists of a cabinet housing the control appartus, the transformer under test, and a precision transformer. The precision transformer has 9 primary taps for primary voltage from 120 to 14,400 volts: 120, 240, 480, 1200, 4800, 7200, 12,000, and 14,400. The ratio test of a potential transformer is accomplished by applying 120 volts to the secondary of the precision transformer, which in turn applies primary voltage to the transformer under test. The secondary potentials are applied to the detector wattmeter, 180 degrees out of phase from each other. The differential in voltage is applied to the wattmeter with five amperes of current either in phase or 180 degrees (approx.) out of phase with the voltage. This phase relationship depends on whether the ratio of the test transformer is higher or lower than the precision transformer. The resulting wattage is directly proportional to the difference in ratio of the test trans-

(Continued on page 119)

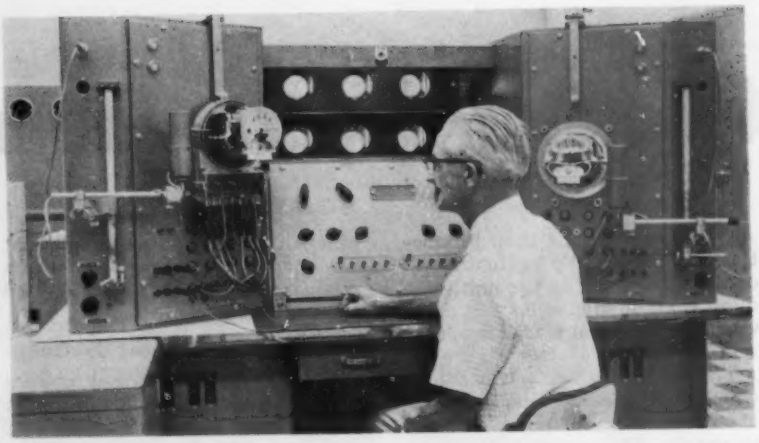


Fig. 4—After carefully evaluating all of the equipment on the market, a duplex automatic meter test panel with two test positions was purchased and placed in operation in April, 1958.

Fig. 5—The current transformer testing equipment includes control apparatus, manual phase-shifting apparatus, and two package-unit precision current transformers. It is housed in an oak-panel cabinet.

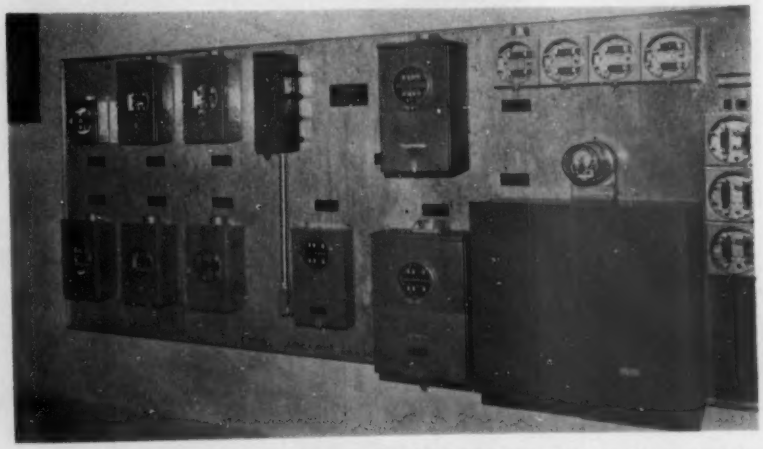
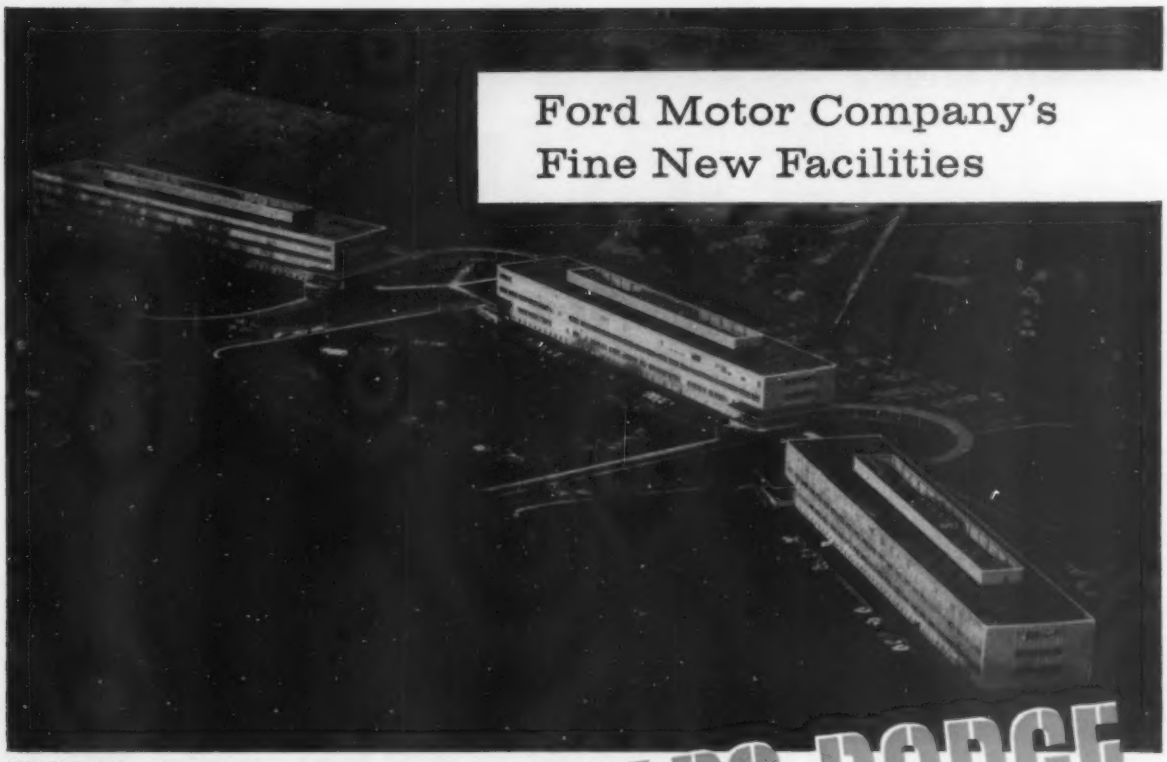


Fig. 6—A display board with typical meter installations is located in warehouse. It is helpful to customers or electrical contractors seeking information on the proper equipment for metering.

Ford Motor Company's Fine New Facilities



HALL ENGINEERING CO., DETROIT
ELECTRICAL CONTRACTORS

WIRE BY PHELPS DODGE

These new buildings for the Staff and Product Engineering activities of the Ford Motor Company at Dearborn, Mich., are striking examples of structures designed to provide for the specific needs and comforts of the people who work there.

Only the finest equipment has been installed in these buildings, including electrical wiring of the highest quality, consisting of dependable Phelps Dodge building wire and Phelps Dodge paper-insulated lead-sheathed power cable.

On every wiring job where top-quality performance, expert workmanship and experienced "know-how" are called for, *it pays to rely on Phelps Dodge and your Phelps Dodge distributor!*

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Factory testing of single-stator watthour meters on automatic digital read-out calibration stations.

Automatic watthour meter testing

◆ DEVELOPMENT of unique electronic equipment for automatic watthour meter testing has been announced by General Electric's Meter Dept., Somersworth, N. H.

The new electronic test unit—designated ETU—was developed specifically for utilities that require fast, laboratory - accurate testing of large quantities of single-phase, self-contained meters.

ETU provides a large, direct digital read-out of per cent registration and has provision for automatic print-out, or IBM-type card or tape punch-out. The latter feature enables a utility to have printed data on each tested meter or punched data for simple, rapid collection and analysis.

Sequencing of ETU is automatic through full, lag and light load calibrations and the device retains visual read-out until cancelled. Read-out is in per cent registration to 0.1% on heavy and inductive loads, and to 0.01% on light load. Accuracy of ±0.1% has repeatability to the same figure.

For simplified maintenance, major units of ETU are "building block" assembled. Pull-out chassis contains all the electronic circuits providing isolation from transients that might be caused by proximity to heavy current components.

Five major units

Five major units, or building blocks, comprise the system. They are the precision reference standard (an especially modified GE IBL-10), loads and control, electronic control unit, gated counter, and data storing or recording devices.

Basically, ETU tests by comparison. One revolution of the meter disc (more or less can be used for special tests) is compared to the proper revolution of the standard.

Pulses, created by the anti-creep holes passing through a light beam, are fed into the "operate" preamp. This signal opens and closes the gate of the counter at preset points, allowing the impulses from the standard to be counted. The count can be converted directly to per cent accuracy, or recorded as a measurement for specialized data handling systems.

Count impulses from the standard are generated by a photoelectric device "picking off" individual lines on a glass disc as they pass the detector. This disc has one thousand lines around its circumference, and is directly connected to the rotor of the precision watthour reference standard.

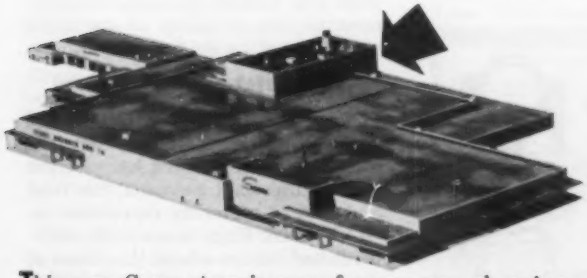
The standard is fed through precision instrument transformers so variation in power supply will not impair over-all accuracy.

Usual time for a complete test —one revolution each on heavy, inductive and light loads—is approximately 56 seconds. The operator need only place the meter in the fixture, press the button, and return later to remove the meter. Data is stored in a visual read-out, printed, or otherwise recorded.

One test operator can efficiently handle several units in a conveyor line set-up and the resulting reduction in test labor costs can greatly reduce operating costs.

POWER ON THE ROOF INCREASES EFFICIENCY...

at Sears' new Amarillo shopping center



This new Sears store is one of many new shopping centers springing up in growing Amarillo, Texas. Following the modern trend, all floor space has been devoted to merchandise and display. Air-conditioning and operating equipment is installed on the roof—out of the way.

To put power where it was needed—on the roof to eliminate the losses and expense of long secondary copper runs—Southwestern Public Service Company selected Kuhlman. A regular user of Kuhlman, Southwestern knew from past experience that Kuhlman transformers would provide the required reliability. Then, too, like all Kuhlman customers, wherever they are located, Southwestern benefits from the close, friendly service of a nearby Kuhlman factory.

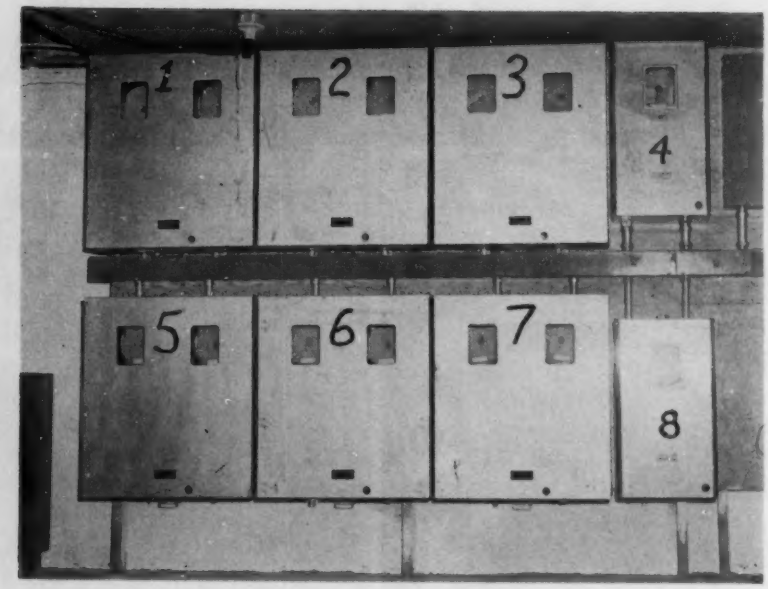
Whether it's distribution or power, for industrial, commercial, or residential use, you'll find Kuhlman transformers are designed to meet standard specifications as well as special conditions. Talk over your requirements with your Kuhlman representative. He lives in your area and knows your needs.

KUHLMAN ELECTRIC COMPANY

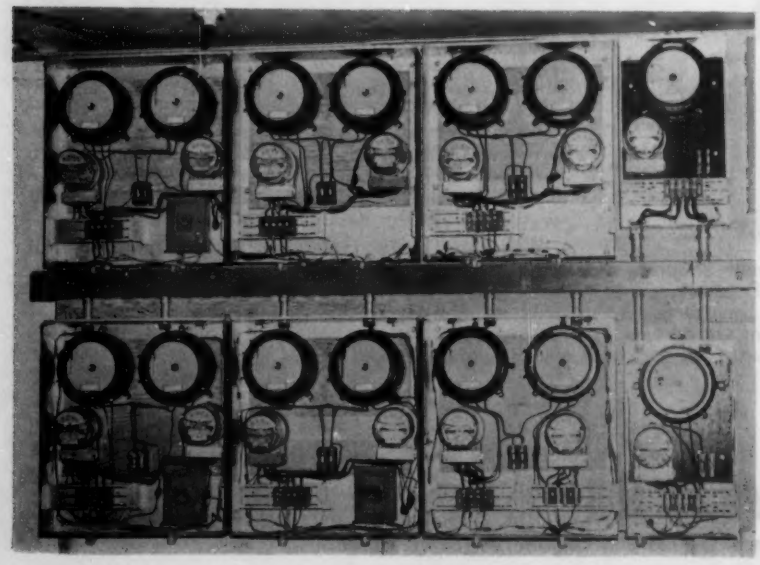
General Offices: Birmingham, Michigan

SOUTHERN DIVISION • CRYSTAL SPRINGS, MISSISSIPPI

Metering residential heating



Two views of an extensive single phase heat pump and resistance heat submetering installation are shown above and below. Meter No. 4 meters total use of all heating and cooling equipment. Sets No. 1, No. 2, No. 3, No. 5 and No. 6 consist of two watthour meters with their current coils in series on a single circuit, one for heating use, one for metering cooling use of heat pump metered. Potential is switched to proper watthour meter by relay in lower right corner of box, relay being actuated by contacts on heat pump. Box No. 7 and No. 8 serve seperate heating circuits. Total use on premises, including equipment metered by this submetering installation, is metered outside building.



By Glenn O. Ladd

Rate Department Manager
Arkansas-Missouri Power Co.
Blytheville, Ark.

◆ CONSIDERABLE general interest has been created by the great amount of publicity devoted to electric house heating and to the heat pump. Apparently people are interested because it seems to be something new and different, something more modern and up-to-date.

There is no disputing the fact that electric heating, of whatever type, offers greater cleanliness and more convenience—but not necessarily lower operating costs. However, in many areas a home may be electrically heated at very little, if any, additional increase in operating cost over conventional fuels, *provided* the house is completely and well insulated before installing electric heating.

In other words, in many localities, the operating cost of electrically heating a well-insulated house compares favorably with the cost of heating the same house with little or no insulation and using conventional fuels. In view of this situation, it is certain that metermen will now more frequently encounter the problem of metering electric heating loads in residences.

Load determines equipment

The amount of load to be metered is of primary interest from the meterman's standpoint, because the size of the load governs the type and cost of metering equipment to be installed. Experience with well-insulated homes where thickness of insulation is not less than 6 inches in ceilings, 4 inches in walls, and 2 inches in floors, and where tight-fitting storm windows and doors are installed, indicates that for the majority of residences, the installed capacity of resistance heating may well fall within the limits of 10 kw to 20 kw, with many installations being not in excess of 15 kw.

Some very large installations may be as much as 30 kw. Where heat pumps are used, the input to

loads

the heat pump compressor motor and fan motors may be as much as 1½ to 1¾ kw per ton of rated capacity.

Auxiliary resistance heaters are usually installed with heat pumps in this area because the B.t.u. requirements of heating load of the residence is greater than the cooling load, and also because air-to-air heat pumps have a reduced heating capacity when outside air temperature drops. One heat pump manufacturer has standardized on installation of 13 kw of resistance heaters in a 5-ton heat pump, these heaters being brought on in increments of 7.8 kw for the first step and 2.6 kw for additional steps.

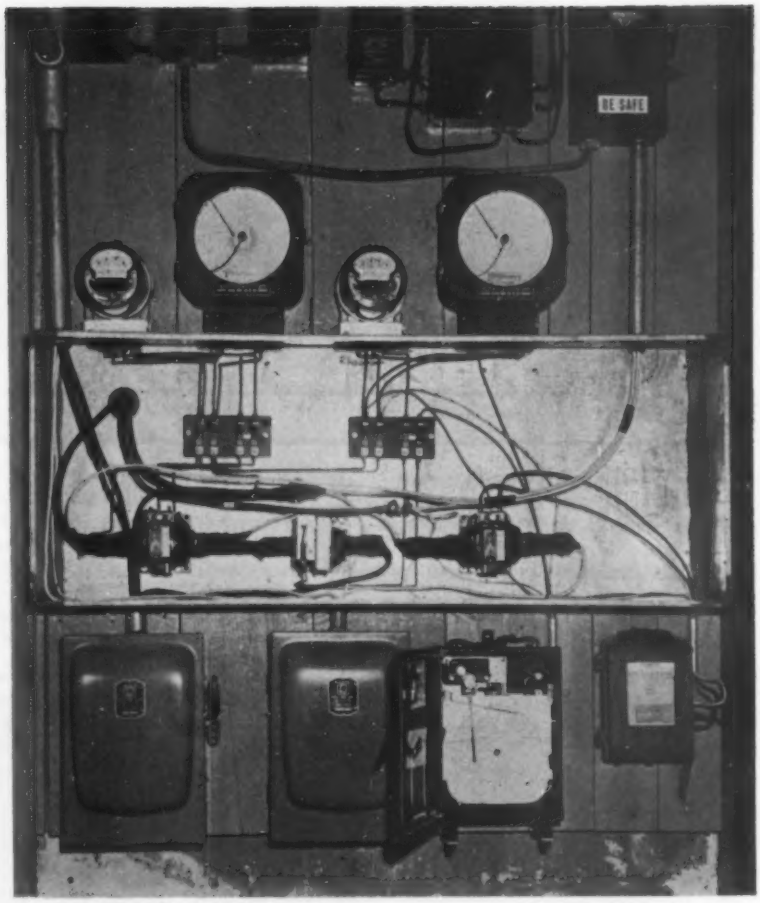
Thus, since the demand of the compressor and fan motors may be as great as 9 kw, a 5-ton heat pump might have a 15-minute demand of about 22 kw maximum in the winter months. In summer months the demand of the 5-ton unit may be as great as 11 kw. Proportional amounts of resistance heating are used by this manufacturer in 3-ton units, the maximum winter demand of the 3-ton unit being about 17 kw.

Single-phase heat pumps used

Although manufacturers in the past have built and sold many 3-ton and 5-ton heat pumps as three-phase units, these units are now available in both these sizes as single-phase units, with compressors hermetically sealed. Therefore, there is no reason why most resistance heating installations and most heat pump installations for residential use cannot be single-phase, and most will be.

In considering possible loads to be metered, it should be borne in mind that where heat pumps are used, there often are operating economies when two units are used instead of one. This is especially true where the winter heating requirements in B.t.u. per hour are disproportionately large in comparison with the summer cooling requirements in B.t.u. per hour.

Thus, metering of residential and small commercial heating and heat pump loads is no great problem, assuming that most installations will be single-phase. (If service is furnished three-phase and if the other residential load is single-phase, both from the same transformer bank, 4-wire delta meters may be used, self-contained.)

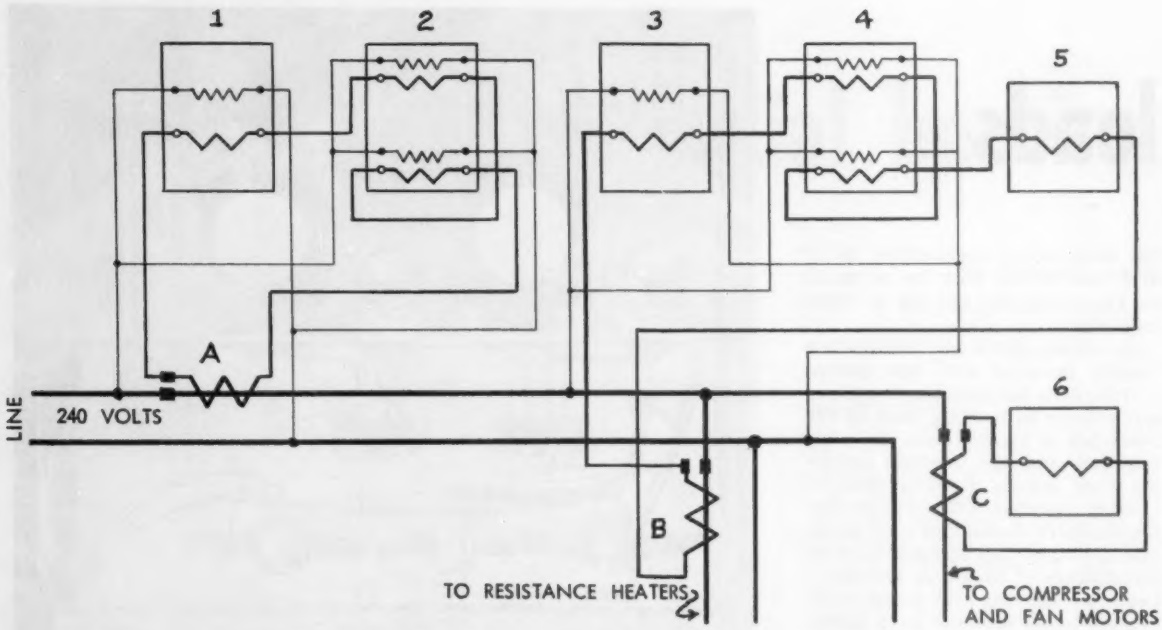


Submetering installation in one of Arkansas-Missouri Power Company's local offices shows cover removed and door open on Bristol recording ammeter. Total heat pump use is metered with watthour meter and Lincoln recording thermal demand meter. Resistance heating is submetered with watthour meter and recording thermal demand meter. Bristol recording ammeter is inserted in metering circuit to record more accurately the on and off operations of resistance heating units. GE Type CF-1 recording ammeter connected in circuit by a current transformer records on and off operations of compressor motor and blower motors. Inkless recorder was found to be more satisfactory than an inking recorder on this highly fluctuating circuit.

Present-day 15 amp., 3 wire, single-phase meters have a continuous capacity of 100 amps.; 50 amp., 3 wire single-phase meters have a continuous capacity of 200 amps. One or more manufacturers supply thermal demand registers for these meters with full-load range of approximately 24 kw and 48 kw, respectively, for these two sizes of meters. Where loads are in excess of the capacity of self-contained 50 amp. meters, metering transformers may be used.

Metermen are quite capable of determining what types and sizes of meters are required for a given load, taking into account probable diversity of load. Normal diversity for the residential load, excluding electric heating or heat pump load, should be used in estimating total maximum demand.

Most residences will have 15-minute demands of 10 kw or less, excluding electric heating and heat pumps. When determining the capacity of the meter to be installed, it is suggested that the following information should be at hand:



Connection diagram of metering installation shown on preceding page. Watthour meters #1 and #3 are 5-ampere, 2-wire, 240-volt, single-phase. Lincoln thermal demand meters #2 and #4 are Type CCW, 5-ampere, 230-volt, 3-phase, 3-wire, 2-day chart. Bristol recording ammeter #5 is 5-ampere, 24-hour chart. GE Type CF-1 recording ammeter #6 is 5-ampere, 30-day chart. Current transformer A: 100-to-5-ampere. Current transformer B: 75-to-5-ampere. Current transformer C: 50-to-5-ampere.

(1) Connected load of electric heating and/or heat pumps.

(2) Probable maximum demand of residence exclusive of heating load. This requires knowledge of connected load and probable load diversity; or, in most cases, experience in metering like loads will give the proper information.

Full demand of the resistance heating or heat pump load should be used in determining capacity of meter required.

Rate schedules classified

The extent of metering and submetering, if any, depends upon the terms of the rate schedule applied. Rate schedules usually fall into the following categories:

(1) All use on the premises is delivered through a single meter and so billed. Demand measurement may be required.

(2) The heating load is separately metered and billed. Demand measurement may be required.

(3) The heating load is separately metered as a *submeter* to the main total use meter. Demand measurement may be required on one or both meters.

Some rate schedules for resistance heating contain a provision that the heating circuit shall be interrupted, or the load reduced a required amount, for a specified interval of time during each 24 hours. The purpose is to control the customer's demand at time of company's system peak hour or distribution system peak hour, thereby justifying a lower rate for electric heating.

Supplying the time switch and perhaps the control switching itself, may be the Meter Department's job. Some companies require the customer to furnish all switching equipment except the time switch. One method of reducing the amount of resistance heating load during such peak hours (usually not longer than 2 consecutive hours) is by reducing the voltage on the 240-volt circuit to 120 volts.

This cuts the amperes in half and reduces the heating load to one-fourth of full-voltage value. This time control and load reduction can be effected by using standard time switches, relays and contractors.

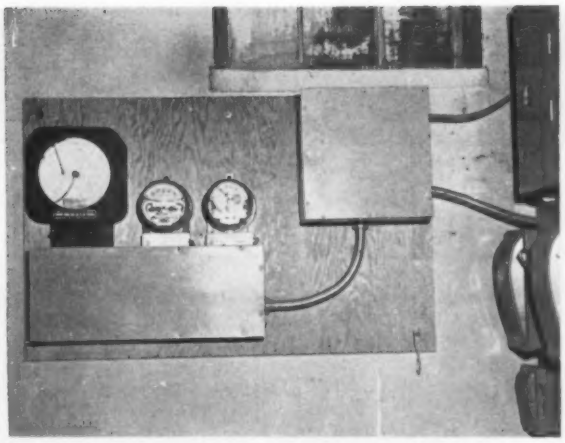
Elaborate metering installations are frequently requested by the Sales, Engineering or Research Departments as a means of obtaining more information about the characteristics of electric heating loads. Frequently it is desirable to separate out various circuits and obtain metering data showing kwh consumption, kw demand, and time of occurrence of demand.

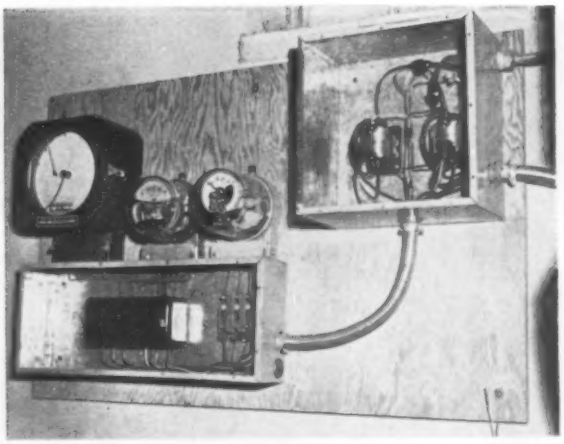
In such instances recording demand meters and possibly recording ammeters are needed. Typical information requested on heat pumps is kwh and kw demand on heat pump motor and auxiliary fans as one circuit, and the resistance heaters as another circuit or as a sub-metered circuit.

Sometimes continuous recording wattmeter charts, and/or recording ammeter charts are requested in order that the time of occurrence of maximum demands of each component of the heat pump, or resistance heating, may be related to outside temperature, system peak load, habits of occupants of the building, and other variable factors. For this purpose, continuous recording charts are necessary. Where resistance heating is metered for such information, various individual circuits may be metered with or without recording equipment.

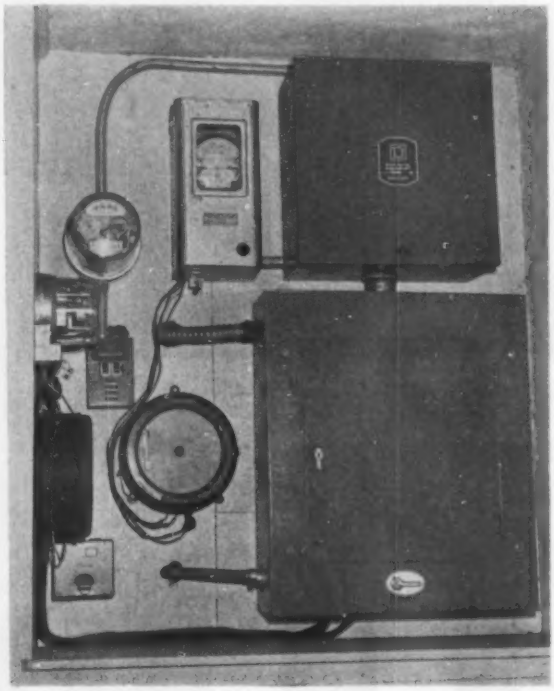
The accompanying photographs of actual metering installations were made on heat pumps for the

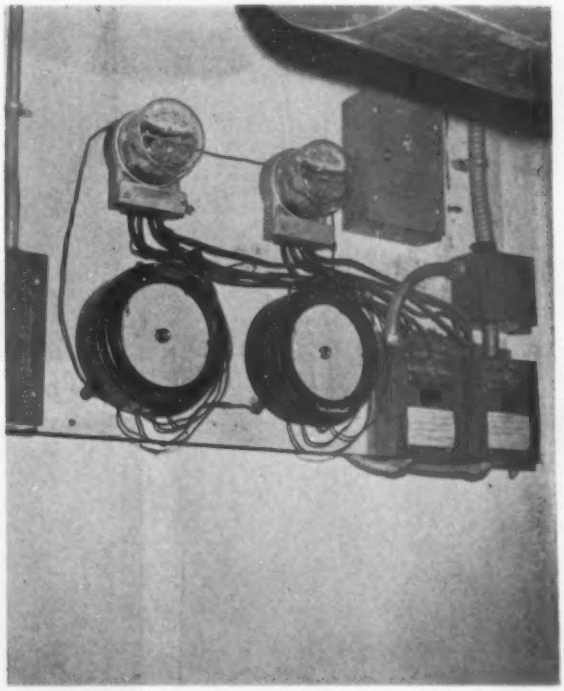
(Continued on page 118)





Above are views of an installation which submeters a 5-ton, single-phase, 240-volt heat pump installed in one of Arkansas - Missouri Power Company's local offices. Total heat pump load is metered by means of two 200-to-5-ampere current transformers, shown in enclosure at upper right side of each photo. Secondaries of the current transformers are connected to the test block, from which are connected Lincoln 120-volt, 5-ampere, 3-phase, 3-wire recording demand meter (thermal type demand), and 240-volt, 5-ampere, 3-wire, single-phase watthour meter. Resistance heating load connected in the heat pump is metered by 15-ampere, 240-volt, 3-wire watthour meter with sweep-hand indicating demand register, 15 minute interval, this being a submeter to the watthour and Lincoln meter, the latter using a 2-day chart.





At left is a view of the total residence metering and the heat pump circuit submetering in a large residence where two heat pumps are installed. The upper box contains a 3-wire, 100-ampere current transformer. The watthour meter connected to the current transformers is enclosed in the box adjacent to the current transformer box, and the G-9 demand meter at the bottom of the photo records total residence 30-minute interval demands. The watthour meter, side view of which is shown at left, and the G-9 demand meter beneath it are submeters which meter the circuit supplying the two heat pumps. Demand meters have 8-day charts. Socket base watthour meter is for water heater with time switch. At right is a view of the two watthour submeters in the basement of the residence for which metering at left is shown. Each watthour meter, and its associated G-9 30-minute interval recording demand meter, meters total use of one heat pump. The G-9 demand meters are actuated by contact devices in the watthour meters. Both watthour meters are 50-ampere, 3-wire, single-phase, 240-volt. Demand veters have 8-day charts.

FRANK ADAM

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Approved by
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ALL IN ONE PACKAGE READY TO INSTALL*

ENCLOSURE | PANEL BASE ASSEMBLY | DEAD FRONT | FRONT COVER

Also furnished completely factory assembled on special order

*Exclusive of circuit breakers

INSTALLS EASIER IN LESS TIME.....
GUARANTEES BETTER CIRCUIT PROTECTION

QP Quicklag-P Circuit Breaker PANELBOARDS

You can slice a big chunk off installation time—and do the job a lot easier—by using these factory-packaged complete panelboard units. All the necessary components, except the breakers, are in a single box—enclosure, panel base, front cover and door—ready to install.

Your wholesaler can fill your requirements for practically any lighting circuit job right off the shelf. From only 9 different panelboard sizes—from 50 to 225 amps—and with space for up to 42 breakers—he can make immediate delivery and save you money, with the safest, most dependable circuit protection available.

(FA) PLUG-IN BREAKER PANELBOARDS HAVE THESE BETTER FEATURES:

- Narrow code-gauge single-piece galvanized steel enclosures, and all other components, are precision die-formed for perfect fit.
- Enclosures have 4" gutters on *ALL* sides to give ample wiring room. Plenty of knockouts for any size conduit.
- Sequence bussing permits any combination of single pole breakers to be made into double pole with handle extensions.
- Silver plated main bus and all other contacts insure positive current-carrying connections.
- Single, instant plug-in pressure-type connections between breakers and bus bars.
- One-piece dead front cover, with knockouts for breakers, is a big time saver.
- Panel base (mounting back) has easy adjustment feature for flush or surface mounting.

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FRANK ADAM ELECTRIC COMPANY

P. O. BOX 357, MAIN P. O. • ST. LOUIS 66, MISSOURI

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safety switches • load centers • Quikheter

SEE OUR CATALOG IN SWEET'S

(FA) QP QUICKLAG-P CIRCUIT BREAKERS

...the best, safest automatic circuit protection made

These individually packaged circuit breakers, with pressure type connectors, are completely interchangeable. They can be pushed in or pulled out as easily as a plug-in extension cord.

- Thermal-magnetic type with quick-make, quick-break mechanism on either automatic or manual operation.
- Trip-free handle prevents contacts from being held closed during abnormal overloads or short circuits.
- Time lag feature prevents tripping on harmless momentary overloads.

Capacities: 10, 15, 20, 30, 40, 50 and 70 amps.
2-pole and 3-pole common trip breakers available.

Three generators and 24 circuit elements plus additional components combine for a total of six generators and 62 circuit elements in the expandable network analyzer shown above. The plug-in programming patchboard below ties together all parts of the analyzer to establish the network for specific study. Spares can be preprogrammed at any time by removing boards.

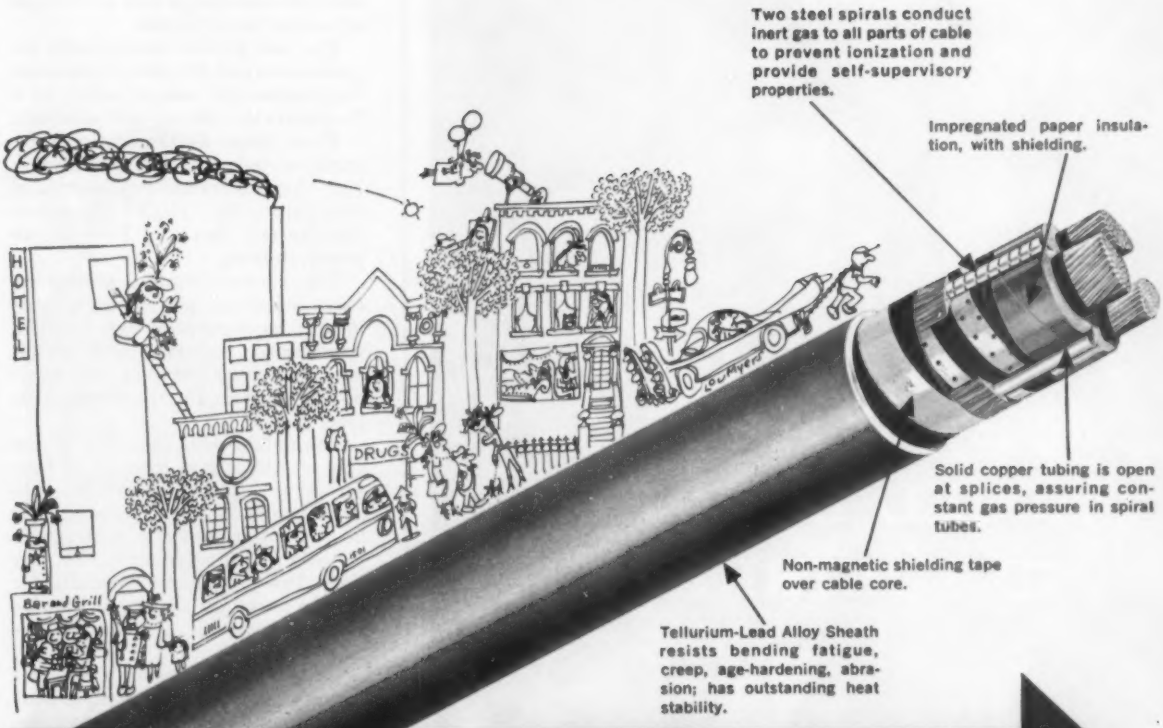
Electrical network analyzer with basic-unit construction permits economical expansion

◆ A NEW CONCEPT in electrical network analyzers, a novel basic-unit design with control center arrangement that will accommodate any future expansion of analyzer facilities, has been designed for engineering colleges and for private users who require only a small unit initially or foresee a need eventually for large-scale facilities.

The first of the new analyzers introduced by I-T-E Circuit Breaker Company has been placed in operation at Lehigh University, Bethlehem, Pa.

The new basic-unit model enables electrical engineering students to simulate electric power generation and distribution problems that exist on power systems throughout the country. It incorporates three generator units and 24 circuit elements.

When expansion is desired, the basic unit's control center accommodates additional analyzer facili-


Two steel spirals conduct inert gas to all parts of cable to prevent ionization and provide self-supervisory properties.
Impregnated paper insulation, with shielding.
Solid copper tubing is open at splices, assuring constant gas pressure in spiral tubes.
Non-magnetic shielding tape over cable core.
Tellurium-Lead Alloy Sheath resists bending fatigue, creep, age-hardening, abrasion; has outstanding heat stability.
HOTEL
DRUG
Bar and Grill

KEEPS UPHILL POWER "ON THE LEVEL"!

ROEBLING
GAS-FILLED CABLE

What happens when solid-type cable is used on steep grades? If you've used it, you know! The oil impregnant simply obeys the law of gravity and drains to the bottom of the grade. At the low point, hoop stress (caused by oil pressure build-up) makes the lead sheath stretch. Eventually a rupture occurs. And in the areas drained of oil, ionization takes place.

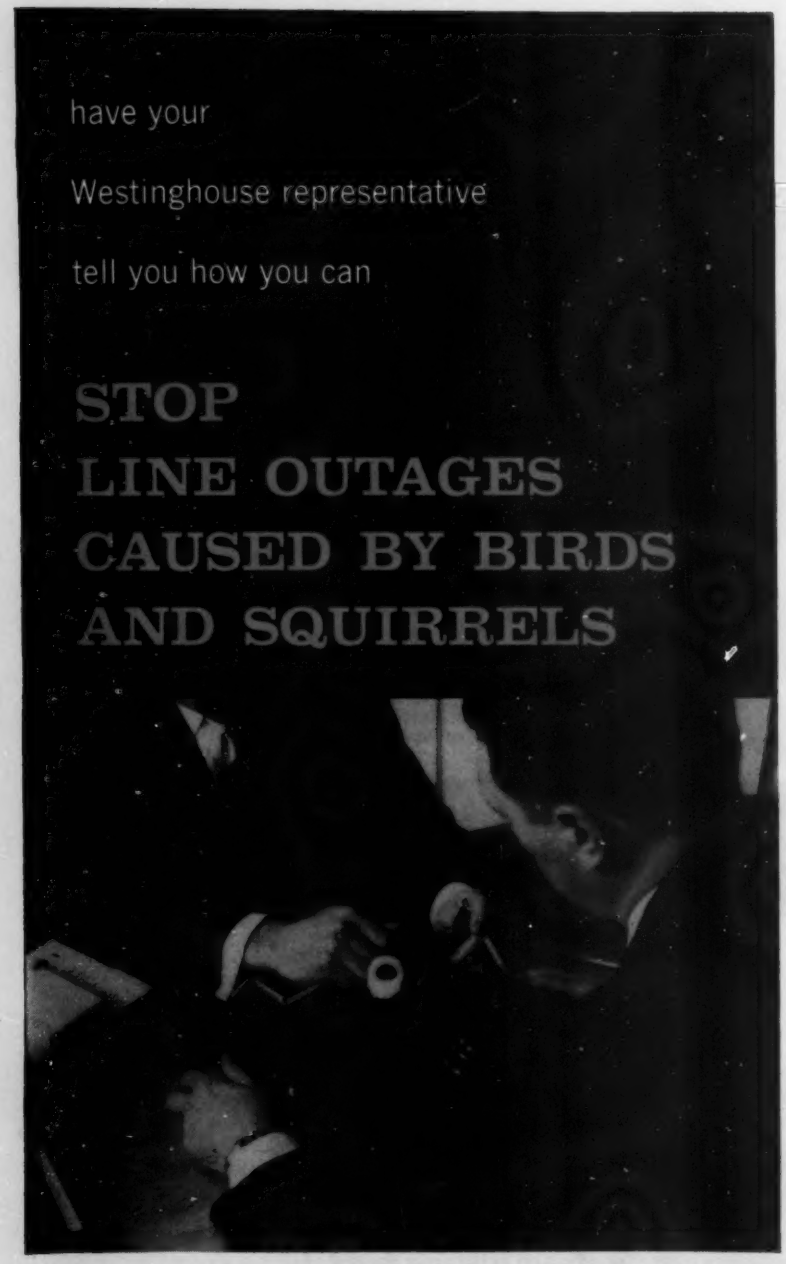
What's the answer to this constant (and inevitable) problem? *Roebling Low-Pressure Gas-Filled Cable*—for voltages up to 46 kv! Dry nitrogen gas, inside this cable at approximately 12 psi pressure, provides consistent dielectric properties throughout the length of the cable. No matter how steep the grade, internal pressure is uniform everywhere.

Another feature of this cable is that it is self-supervisory—an alarm system lets you know if there's trouble along the line.

Roebling Low-Pressure Gas-Filled Cable is as easy to splice as solid-type paper power cable. It offers the least expensive long-term answer to the problem of transmitting power uphill! Get the whole story from your Roebling Field Representative soon. Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

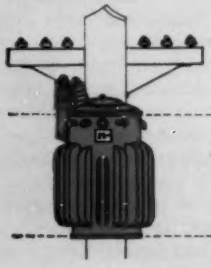
ROEBLING

Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation



Now—an all-new plastic-coated cover for distribution transformers above 5 kv offers new protection against line lockout . . . Another answer to changing needs, made possible by Plowback of earnings into distribution transformer research and development.

J-70837



YOU CAN BE SURE...IF IT'S

Westinghouse

ties which can handle electrical network simulation and analysis of an entire large system.

The Lehigh unit incorporates six generators and 62 circuit elements. Full expansion would result in a 21-generator 400-circuit analyzer.

Three major design advances are incorporated in the new analyzer: (1.) Control center flexibility and simplicity; (2.) High - impedance base design; and (3.) Five-degree phase-shifting.

The control center, combining basic simplicity and complete flexibility, incorporates the network patchboard, metering and associated switching controls, and basic power controls for the entire analyzer.

The patchboard, mounted on the cabinet directly in front of the operator, is extremely compact — 13 inches wide by 10 inches high. The boards are removable and spares can be pre-programmed at any time. Pre-programmed boards for all or parts of a system can be stored for use at a moment's notice.

On the desk — a cantilever projection from the main control center cabinet — are meters which indicate current, voltage, megawatts and megavars. All network points are metered so that any part of any circuit may be analyzed.

Precise metering accuracy is provided through use of high-accuracy, laboratory-type instruments and permanent, built-in shunts in each circuit. Calibration of the lowest setting on the line units compensates for the shunts and the lead wiring. This method eliminates variations in the network which would be caused by inserting shunts at various network points.

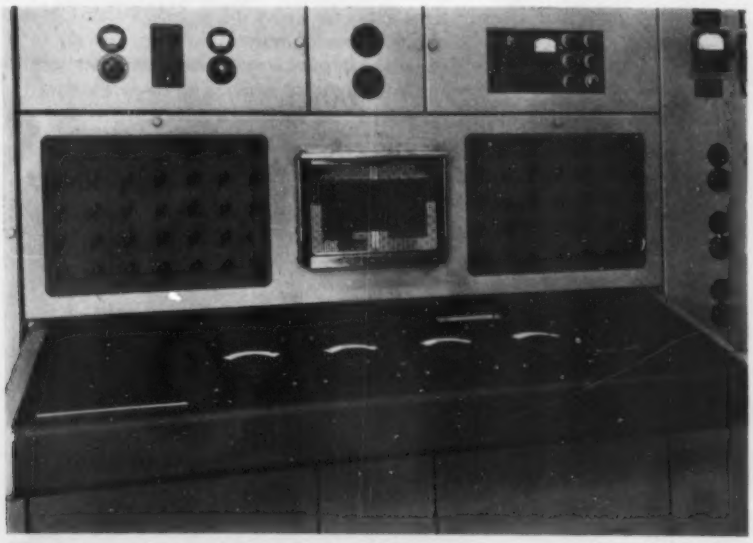
Use of a 4000-ohm, high-impedance base eliminates the burden that is placed on a simulated system by conventional low impedance circuits. It also eliminates the need for trial-and-error required by these same low impedance circuits when easing up to high currents.

This high-impedance system cuts time required to set up and analyze a network while eliminating both the chance of overload circuits and the need for larger equipment to handle greater capacity.

Five degrees of phase shift, on a cartesian frame of reference, has been provided to compensate for the unwanted, but inevitable loss in the resistance of inductance units because simulated induct-

(Continued on page 116)

Programming patchboard, 13 inches wide and 10 inches high, is being inserted by G. E. Heberlein, engineering vice-president at I-T-E, and J. J. Karakash, electrical engineering professor, Lehigh University.



Master console has four large, easily read instruments for measuring current, voltage, watts and vars. By means of a multiplier the system power quantities can be read directly on the wattmeter and varmeter.

Now . . .
economic
change-out time
signaled
automatically

WITH
WESTINGHOUSE
CSP
DISTRIBUTION
TRANSFORMERS

Ask your Westinghouse representative for the CSP story . . . another answer to changing needs, created through Westinghouse leadership in distribution transformer development.

J-70851

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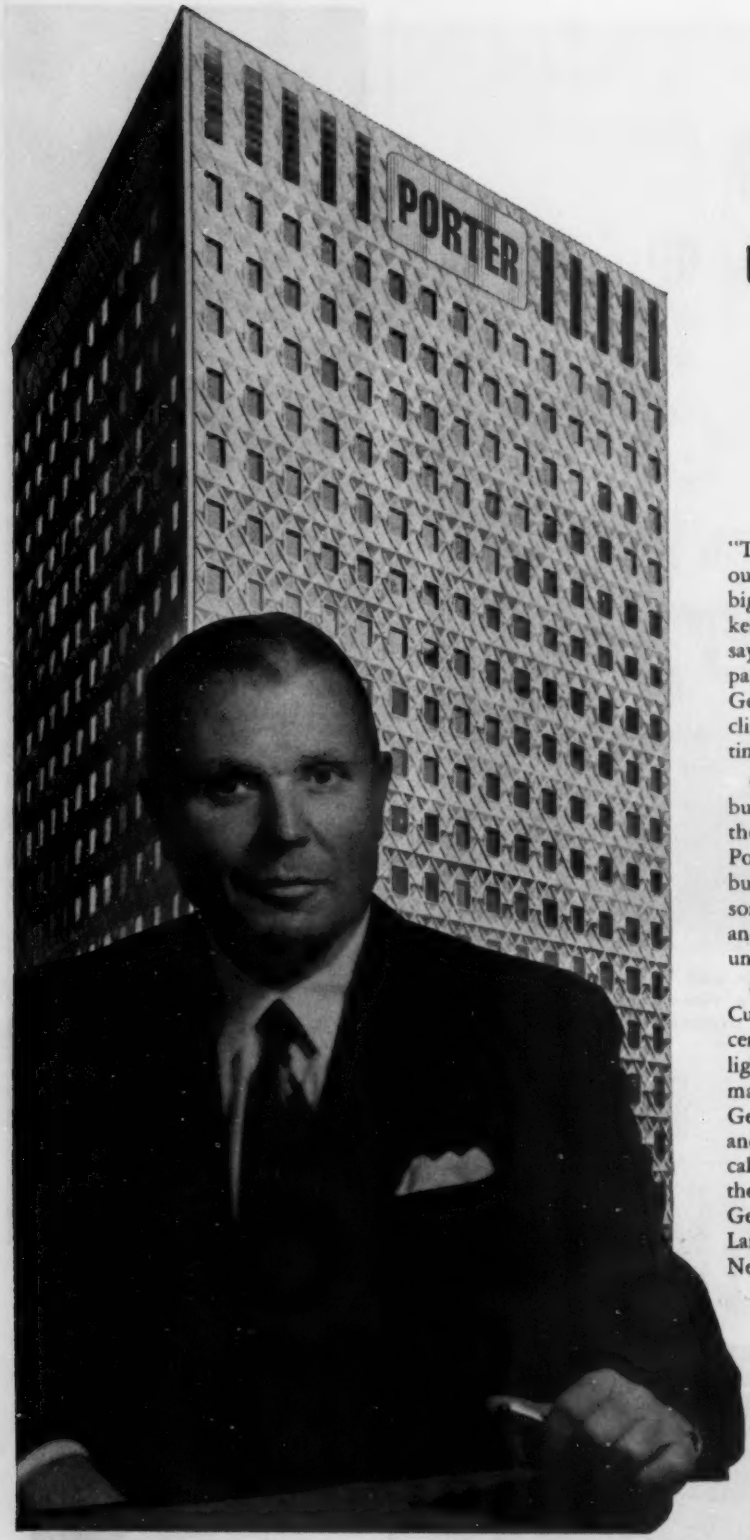


Pittsburgh's New Porter Building uses General Electric fluorescent lamps for economy

"The lamps themselves are only a small part of our over-all lighting costs, so we look for the big economies that come with the lamps that keep our total lighting costs to a minimum," says T. M. Evans, Chairman, H. K. Porter Company, Inc. "In addition to these economies, General Electric fluorescent lamps contribute to climate control which creates 'eternal springtime' in the new Porter building."

Conveniently located in the heart of Pittsburgh's business district across the street from the city's two major hotels the sixteen-story Porter building was erected faster than any other building of its kind in the city. It is tenanted by some of the best names in American industry, and has modern, up-to-date office space that is unsurpassed in Pittsburgh.

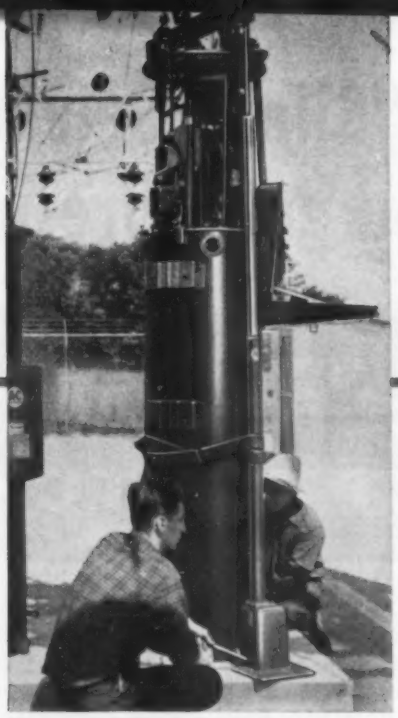
G-E Lamps are giving Porter extra value, too. Customers who have used G-E 40-watt fluorescents exclusively are getting 38 per cent more light today than they did in 1950 because of the many improvements that slip quietly into General Electric Lamps to improve light output and keep lighting systems up-to-date automatically. Call your local G-E representative and get the whole story. Or write: General Electric Company, Large Lamp Dept. C-841, Nela Park, Cleveland 12, O.

Operation up turn

Progress Is Our Most Important Product

GENERAL ELECTRIC

G-E LAMPS GIVE YOU MORE VALUE FOR ALL YOUR LIGHTING COSTS



Convenient, easy-to-use hydraulic untanking jacks are available to all Allis-Chalmers regulator users.

Mobile unit carries all needed tools and repair parts. Oil storage tank, filter press and dielectric oil tester are in trailer.

ALLIS-CHALMERS

NEW Field Service Unit

combines regulator training and service

Mobile service unit brings trained service personnel and instruction on preventive maintenance to regulator site.

THIS mobile unit has proved to a growing list of utilities the economy of preventive maintenance on a planned program.

Utilities are encouraged to have their own men participate for training.

The service includes detailed inspection of mechanism, checking band width, voltage level, and relay contacts, retouching paint, replacing parts and filtering oil if necessary . . . thus extending regulator life . . . eliminating potential troubles.

All service, whether for single or three-phase regulators, is done at the regulator site. Full advantage is taken of *unit construction* of Allis-Chalmers regulators. Downtime is reduced.

See New Movie

Additional information in colored 16-mm sound film can be obtained by contacting your nearest A-C office or writing Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5584

Let this "Silent Salesman" help you get more jobs

SPECIFICATION GRADE

CIRCLE F NO-KLIK® QUIET SWITCH

Circle F NO-KLIK Quiet Switches clinch many a job for the electrical contractor. It's amazing what an enthusiastic response you can get merely by handing one to a prospective customer and letting him flick it on and off a few times. Everybody wants it, once they discover what a contrast there is between its quiet, smooth operation and the sharp click of the ordinary switch.

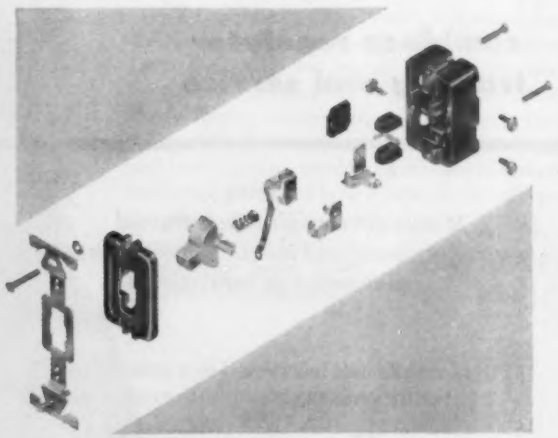
The NO-KLIK Switch is a natural for bedrooms, nurseries, libraries, hospitals, offices, hotels—wherever quiet is desirable. Many home-owners want them for all rooms. Let Circle F NO-KLIK Quiet Switches help you land more jobs—and satisfied customers. See your distributor, or write us direct.

Simple, compact mechanical design — no mercury or fluids

Exploded view shows simplified construction . . . silver contacts for smooth, reliable, lifetime switching action . . . operates in any position . . . totally enclosed mechanism has #8 binding screws to take wire up to No. 10.

15 Amp., 120 Volts, A-C only [L]	20 Amp., 120 Volts, A-C only [L]
15 Amp., 120-277 Volts, A-C only	20 Amp., 120-277 Volts, A-C only
#3401 S.P. Brown	#3421 S.P. Brown
#3401-I S.P. Ivory	#3421-I S.P. Ivory
#3402 D.P. Brown	#3422 D.P. Brown
#3402-I D.P. Ivory	#3422-I D.P. Ivory
#3403 3-way Brown	#3423 3-way Brown
#3403-I 3-way Ivory	#3423-I 3-way Ivory
#3404 4-way Brown	#3424 4-way Brown
#3404-I 4-way Ivory	#3424-I 4-way Ivory

Approved for control of Fluorescent Lamps on A-C circuits of 277 Volts and less and for motor loads up to 277 Volts at 80% of current rating of the switch.



Circle F Mfg. Co.

TRENTON 4, NEW JERSEY

IN CANADA: VERD-A-RAY ELECTRIC PRODUCTS LTD., MONTREAL 9.

For your wire requirements: Eastern Insulated Wire Corp. (A Subsidiary), Box 591, Trenton, N. J.

EVERY
COPPERWELD
GROUND ROD
is

molten-welded

This microphotograph of the Molten-Weld shows how the grains of copper and steel interlock to form a permanent, continuous weld. No other process achieves this inseparable union.

WHAT'S THE ADVANTAGE?

By this unique Molten-Welding process—used only by Copperweld Steel Company—a uniformly thick sheath of pure copper is inseparably welded to an alloy steel core. Under carefully controlled conditions, the grains of both metals interlock to form a permanent, continuous weld. And from the moment of this union, Copperweld* performs as one metal. Hot rolling, cold drawing, temperature changes, pounding, or abuse cannot destroy the Molten-Weld in Copperweld Ground Rods.

WHAT DOES THE MOLTEN-WELD IN COPPERWELD MEAN TO YOU?

In service, this permanent Molten-Weld completely eliminates the possibility of harmful electro-galvanic action in the presence of moisture. There are no microscopic cracks, fissures, or pin holes in the thick copper exterior to admit moisture and give destructive rust a foothold.

So, for permanent grounding protection at lowest annual cost, insist upon Copperweld Ground Rods and get the rust resistance and conductance of copper plus the strength and easy-driving qualities of alloy steel. The time-tested dependability and economy of Copperweld products have been proved in service for over 40 years. *Trade Mark

COPPERWELD STEEL COMPANY WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

DRIVE DEEP with Copperweld sectional ground rods
TRADE MARK
FOR low resistance THE YEAR 'ROUND

Completely protected distribution

By James S. Holtzinger
Application Engineer
Pennsylvania Transformer Div.
McGraw-Edison Co.

◆ THE SUBURBANITE substation has been developed by Pennsylvania Transformer Division, McGraw-Edison Company, to satisfy a growing need for low-cost, easily installed substations. Designed specifically for small towns, rural areas and outlying industrial plants, the Suburbanite offers definite advantages in these and other applications for which conventional substation equipment may be too complex and, consequently, too expensive to be justified. Both single-circuit and multi-circuit units are available.

Appreciable economies can be realized with the low-cost, factory-assembled, shipped-in-one-piece Suburbanite. Through the use of dead-ending structures, both high voltage and low voltage lines can be terminated at the transformer and the expense of steel substation structures eliminated.

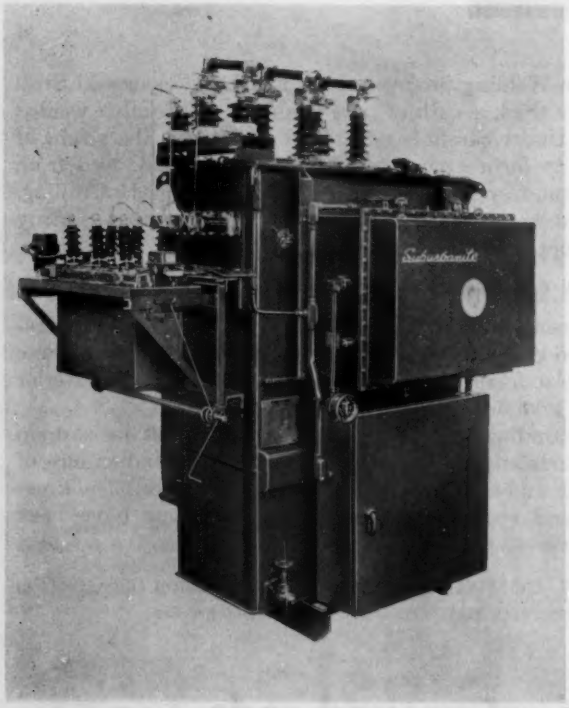
When pole lines are conveniently close to the point of installation, slack sections can be used to connect Suburbanite substations directly to these nearby line poles. The one-piece construction also has reduced installation labor costs by eliminating the assembling and erecting of component parts normally associated with substation installation.

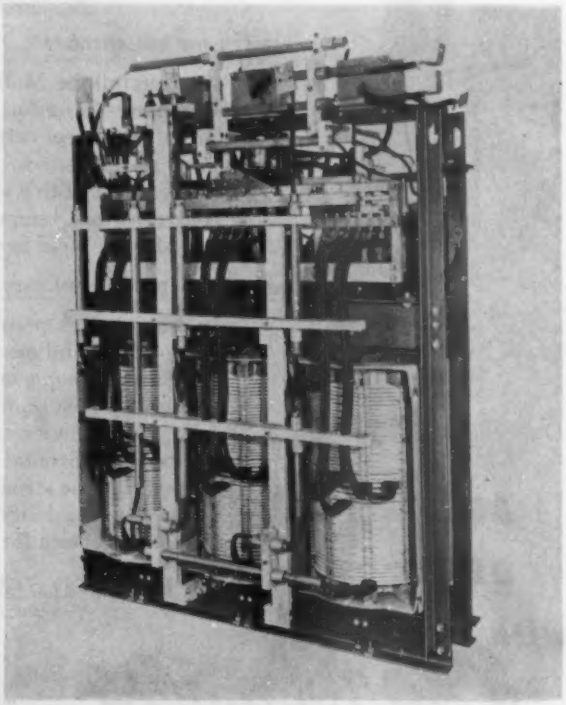
Savings on initial cost

In addition to permitting more economical installation, the Suburbanite represents savings of as much as 25% in initial cost. In comparison, a metal-clad single-circuit unit substation of equivalent rating is approximately $10,000 more expensive. The Suburbanite provides this outstanding economy without sacrificing quality of operation.

In place of the usual circuit breaker, the Suburbanite uses a fast-operating, completely automatic recloser that clears the low voltage line in the event of a fault in 2½ cycles — or approximately twice as fast as the equivalent circuit breaker. This fast clearing time minimizes conductor damage and burndowns that result when fault currents are permitted to exist for longer durations. The adjustable reclosing and tripping sequence of the Suburbanite makes possible easy fuse-recloser coordination with line fuses as well as transformer primary fuses.

Studies (AIEE Papers 54-363 and CP 58-6) have shown that 80 to 90 percent of faults occurring on





A typical 1000 kva, three phase "suburbanite." A dead-ending structure (not visible) is located on the high voltage side of the substation. The built-in winch permits the bottom section of the recloser to be lowered to facilitate inspection of the contacts. Internal view is shown at right.

circuit for remote locations

a grounded electrical system can be cleared by one or two fast tripping operations with a short period of open-circuit time between tripping and reclosing.

Study of 5,000-volt systems

A study of 5,000-volt systems showed that 42 per cent of the faults on an ungrounded system were of a temporary nature. While rapid-action reclosers have been used for many years on rural systems, only recently have reclosers been available with sufficient load-carrying and interrupting capacities to be considered for urban use.

The high and low side lightning arresters mounted directly on the Suburbanite provide complete surge protection for all applications. The primary fuses mounted between the high side lightning arresters and primary bushings protect the system, and also the Suburbanite, from any excessive fault currents that are not immediately interrupted by the recloser.

Suburbanites are available in all kva ratings within the capacity represented by their rated secondary voltage and the rated current of presently available reclosers. The standard design of the Pennsylvania Transformer Suburbanite favors the Kyle Type R and Type W reclosers, which have continuous current ratings of 400 and 560 amperes respectivcly.

These reclosers are rated 100 and 200 mva, with maximum interrupting abilities of 4000 and 8000 amperes, respectively, at 14.4 kv, or 6000 and 12,000 amperes at 2.4 kv. High voltage ratings of 15 kv and up, either delta or wye connected, are available. The low voltage rating usually is restricted to ratings from 2.4 kv to 15 kv, connected either wye or delta; however, special applications using single-phase, 23-kv, 100-ampere reclosers have been proposed for 69,000 delta—13,200 delta/23,000Y /13,200-volt Suburbanites.

In all available sizes, the flexibility of the Suburbanite's design permits the purchaser to buy only the accessories required for each installation, and to choose the ratings of these components so that they are adequate, but not excessive, for each installation.

Load tap changing equipment

Suburbanites are available with or without load tap changing equipment for automatic plus and minus 10% regulation. Units containing automatic LTC equipment are available with externally and/or internally mounted potential supplies for the voltage regulating relay, LTC control power, and forced cooling equipment.

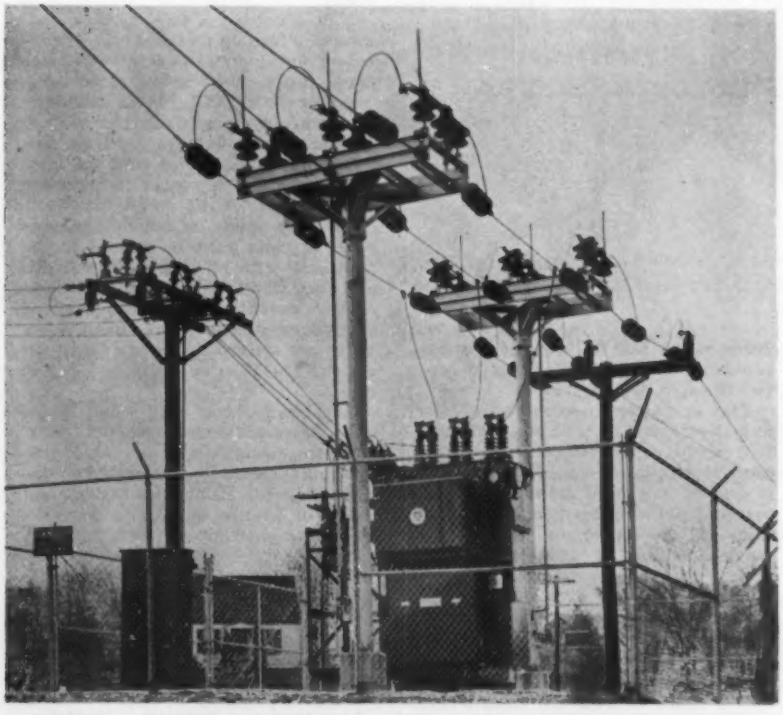
The externally mounted potential supply normally is recommended because of its being conveniently accessible for inspection, changing of protective links, or complete replacement. Should a contingency require that the potential or control power supply be replaced, a standard Protected Pole Star distribution transformer can be used.

When LTC equipment is not included, the need for potential or control power supply can be eliminated. The recloser has series trip, and its operating solenoid is designed to be energized from line voltage. The need for control power for forced cooling equipment can be eliminated by using a self-cooled Suburbanite.

The inclusion of lightning arresters is at the purchaser's discretion, and to further extend the flexibility of the Suburbanite design, either intermediate or station-type lightning arresters may be specified.

Primary power fuses are included at the purchaser's option to facilitate his specifying a Suburbanite that is suited to his needs. When fuses are included, the purchaser is at liberty to choose an interrupting capacity that is coor-

(Continued on page 116)



The Suburbanite was developed to meet the ever-increasing demand for an economical method of providing a completely protected distribution circuit for rural areas, small towns, and outlying industrial sites.

Notes on new utility equipment

Galvanic corrosion reduced with new distribution clamp

A NEWLY DESIGNED distribution clamp is being offered by Reliable Electric Company, Franklin Park, Illinois. The clamp is for use with distribution size conductors of copper, aluminum, and ACSR. The design based on the mass anode principle, reduces galvanic corrosion to insignificant proportions. This will eliminate the need for copper liners for copper to aluminum connections. These clamps are made in three sizes to accommodate a range of conductors from 6 to 1/0, from to 4/0, and from 1/0 to 336.4-strand, solid and ACSR.

Other new features include a single nut so that tightening is accomplished with one wrench against another and all parts are captive. Also, conductor range is clearly stamped on each clamp. These features make installation easy.

Reliable offers the new distribution clamp with or without factory-applied inhibitor compound. Clamps with inhibitor compound are individaully packaged in polyethylene bags.

For additional data, ask for item U-901, using the coupon on page 121.

High voltage test sets are completely redesigned

A NEW LINE of high voltage a-c test sets is now available from General Electric's High Voltage Specialty Transformer Section, Distribution Transformer Department, Holyoke, Mass.

Completely redesigned for ASTM methods of testing dielectric materials, the test sets come in standard ratings from 20 to 350 kv, 2 to 1,000 kva. All but the largest ratings can be mobile.

The sets can be used by industrial plants, utility central stations, and laboratories to test dielectric materials, insulating oils, high voltage cables, and all kinds of electrical apparatus.

Each test set is a complete equipment from the plug-in point on the user's power supply. Each has three basic elements: controls and meters, an autotransformer or regulator to vary the input voltage, and a high voltage testing transformer.

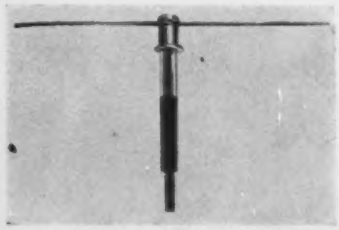
The smaller ratings have all three in one compact cabinet that can be mounted on castors for moving to various test stations.

The middle range of ratings, between 50 and 150 kv, 5 to 25 kva, have control and regulating sections in one cabinet and the hv transformer separate. For mobile use, both parts can be mounted on a single dolly.

For additional data, ask for item U-902, using the coupon on page 121.

Load pickup tool operates at 7.8 kv, 200 ampere maximum

THE LOAD-PICKUP tool now offered by the A. B. Chance Co., 210 N. Allen St., Centralia, Mo., will safely pick up and carry a maximum of 200 amperes at 7.8 kv. Its jaw opening accommodates 250 MCM stranded copper through 6 solid copper.



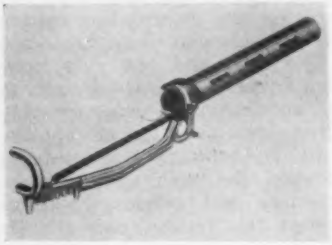
The operating mechanism of the tool is powered by a strong compression spring that closes the contact plunger with such speed that no arc is drawn. The high-dielectric, transparent handle makes general inspection of the operating mechanism easy, checking of contact position with each use, a simple matter. Silvered against overheating, the multifingered contacts are of beryllium-copper.

The simplicity of the design of the Load-Pickup Tool makes it easy to use. It can be applied to and removed from the conductor with just one hand. For nonslip handling, the gripping area of the handle is coated with Chance Safety Tread. Strongly made for long peak performance, the tool features a high-conductivity aluminum head to reduce weight and improve handling.

For additional data, ask for item U-903, using the coupon on page 121.

Tool lashes cable up to 1¼ inch diameter

THE NEW lashing tool and method offered by Hubbard and Co., 6301 Butler St., Pittsburgh 1, Pa., provides a means of lashing cable and messengers which is within the reach of smaller companies as well as providing substantial savings to the large ones.



The Hubbard Cable Lasher consists of a lashing tool and tube of precoiled lashing wire and will lash cables up to 1¼" in diameter using messengers up to 5/16" in diameter. Spans of any length can be handled. It is necessary, however, to have sufficient lashing wire around the messenger wire at the start to complete the job.

On long spans, additional coils or parts of coils must be spliced to the first coil, with an appropriate sleeve and tool, at the beginning of the operation as coils cannot be added if wire is exhausted in midspan. After wires are spliced, tubes are taped together. The 2" tube contains 150 feet of wire.

A cable guide is used when larger size cables are being lashed to support the weight of the cable and faciliate operation. Complete instructions for using the lasher and tables of lengths of lashing wire required for each job are included with each tool.

For additional data, ask for item U-904, using the coupon on page 121.

Switch base features universal mounting

LINE MATERIAL Industries, McGraw-Edison Co., Milwaukee 1, Wis., announces availability of switch bases designed for universal mounting, each

No. 5 in a series

Right off the Wire

An ion microscope has been made that will magnify five million times.

&

A new unit attaches to the turntable of any record player and converts it into a tape recorder.

&

All cords and cables give better service when handled properly. TIREX® portable cords and cables, *although jacketed with fortified and tempered neoprene armor and "lead cured" for toughness and smoothness*, will give still longer service if not subjected to unreasonable abuse.

&

A new digital computer for automatic air navigation and bombing will perform 62,500 computations per second. It is said to be the fastest airborne system.

&

Theoretically, small hydrogen bombs exploded at the rate of two an hour in an underground chamber, could produce twelve per cent of all the electric power in the United States.

&

Belt drive through variable-speed pulleys is used in a new foreign automobile.

&

Short wave radio signals have been transmitted half way around the earth without material distortion by reflecting them from a flat spot on the moon. The method might be used for intercontinental telephone calls.

&

A church in the tropics has a concrete roof covered with sprayed-on white synthetic rubber. It reflects heat and has proved to be economical in application and maintenance.

&

Plans have been announced for a power transmission line to carry 750 kv, about twice the voltage now carried in this country.

Sound waves are being used to weld aluminum foil.

&

C-L-X (sealex) is Simplex' pliable, corrugated metallic lightweight exterior sheath. It is an impervious pliable DUCT — with the Simplex cable of your choice *built-in*.

&

By using polarizing filters on searchlight lenses and filters with opposite polarization on viewing glasses, the reflections from water droplets can be minimized and better vision in fog obtained.

&

Nuclear batteries appear to be the most promising power source for the electrical systems of satellites. Heat produced by the radiation from an isotope is converted by a thermocouple into electricity.

&

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

&

Powdered metal parts can now be made up to thirty inches in diameter.

&

A radio that can be carried in the hand is said to be the first tubeless two-way set for use in VHF mobile communications.

&

A supersonic burglar alarm gives a warning whenever there is the slightest movement of anything within its area.

&

An electronic instrument can be made to talk in any language. Coded signals sent to it are converted into actual speech.

&

New fluorescent highway lamps, believed to be the most powerful in the world, give 55,800 lumens of light.

&

A car-sized heat pump is being developed that will cool or heat an automobile interior.

Waterproof, heat-sealed shipping bags made of polyethylene film are said to be stronger than those made of conventional materials.

&

A tape recording system has been designed that will monitor twenty-eight radio frequencies simultaneously twenty-four hours a day.

&

A ceramic paint has been developed that does not have to be fired, will not flow at high temperatures and dries in thirty-five minutes.

TIREX® is TOUGH

"TIREX" is the trailing cable that feeds power to this giant strip mining shovel. "TIREX" cords may also carry the current to your workshop tools and be subjected to the rigors of life on portable saws and sanding machines. Tough, flexible "TIREX" assures you of long, unfailing service and unequalled economy. That's why manufacturers of quality products insist on "TIREX"® (*made only by* SIMPLEX).

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

"The American manufacturers of transoceanic telephone cables"

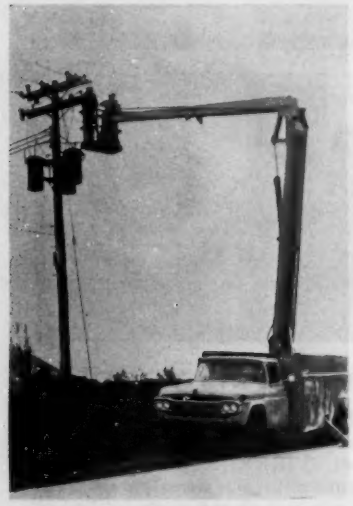
of which has movable clip angles providing a range of mounting dimensions adjustment to cover all known individual requirements. The bases are said to compensate for inaccuracies or errors in mounting-frame dimensions. Those ordered for a specific location may be easily adapted for future use at another location by simply repositioning the clip angles.

Items provide a completely flexible arrangement for spacing between front- and rear-mounting bolts, with mounting dimensions determined by size and type of mounting frame. Both width and length dimensions between the four attachment points can be varied by bolting the clip angles to the support channel in different positions.

For additional data, ask for item U-905, using the coupon on page 121.

Aerial platform available for 40 and 50 foot heights

A COMPLETELY new aerial platform, known as the Pitman Aerial Platform, is now being manufactured by Pitman Manufacturing Co., 300 W. 79th Terrace, Kansas City, Mo. Available in two models for working



heights of 40 and 50 feet, the new product replaces a personnel lift called Giraffe which the company formerly manufactured.

Design simplicity is featured in the new lift, resulting in a more compact unit, one that requires considerably less headroom, also less space for installation on the truck. The 40' model has a capacity of 1,000 lbs. and the 50' model 500 lbs.

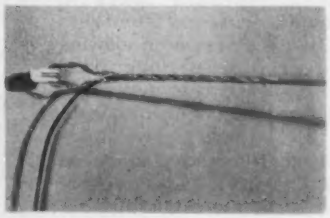
Another big improvement is a completely redesigned control system. The operator on the platform now operates valves of the hydraulic system by a direct mechanical linkage control system. Movement of simple, hand-operated levers on the platform brings immediate, positive response of the hydraulic system. This feature also has made it possible to eliminate all hydraulic hose in the upper boom, greatly simplifying maintenance.

Simplified design has made it possible to make a considerable reduction in cost, without making any sacrifices in capacity, boom reach or safety features. Power for the unit can be supplied by the truck engine through a power take-off, or by a Wisconsin engine, which Pitman furnishes. Also available is a compressor for operation of air tools.

For additional data, ask for item U-906, using the coupon on page 121.

Drop-wire dead-ends are easily applied and removed

PREFORMED STAINLESS steel drop-wire dead-ends for all sizes of telephone drop-wire are now available from Preformed Line Products Co.,



5349 St. Clair Ave., Cleveland 3, Ohio. They are neoprene-coated to facilitate application and removal and to cushion the gripping action, thereby eliminating abrading or cutting through the insulation. This combination of stainless steel and neoprene gives excellent corrosion resistance for all areas.

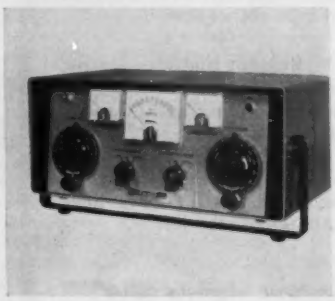
The principle of distributing uniformly low pressure over a large area assures trouble free service by eliminating concentrated stress which might damage the wire jacketing.

The multiple-wire loop minimizes bail fatigue. Preformed drop-wire dead-ends are easily applied and removed and are neat in appearance.

For additional data, ask for item U-907, using the coupon on page 121.

Comparator features easy-to-read dials

THE CURRENT TRANSFORMER comparator now offered by Knopp, Inc., 1307 66th St., Oakland 8, Calif., portable-type Model CTC-3, features new instruments and vernier dials that are



easier to use and read, thus enhancing greater accuracy, according to the manufacturer.

This current transformer comparator features freedom from the effects of stray fields, harmonics, and heavy overload test currents.

With self-contained ammeter of 1, 10, and 20 ampere ranges the total burden imposed upon either the standard current transformer or the transformer-under-test is less than 0.1 volt ampere. Included also is a detector for wrong polarity or other improper transformer connections.

Normal full scale error ranges are 0.64 per cent in ratio error with 0.01 per cent divisions and 35 minutes in phase angle with one-minute divisions. A range switch affords a multiplying factor of ten.

Overall accuracy is within one-half division for secondary currents from 0.5 to 20 amperes. Both ratio error and phase angle are measured simultaneously and are direct reading. Except for the loading transformer and standard transformer, no auxiliary equipment is needed.

For additional data, ask for item U-908, using the coupon on page 121.

Interrupter switch control employs positive actuation

A NEW LOW-COST system for remote or automatic control of its HPL-C metal enclosed interrupter switches has been developed by R&IE Equipment Division, Greensburg, Pa., of I-T-E Circuit Breaker Co.

The new system, employing positive pneumatic switch actuation, can be incorporated on the line of HPL-C switches from 600 through 2000 amperes and 2.4 through 14.4 kv.

Consisting of a double-acting air motor, linkages, solenoid valve and air cylinder, the system permits three principal types of operation: remote pushbutton control, automatic throw-over schemes, and circuit opening on overload with thermal or overload relay sensing.

Here's how contractors net:

top profits per job with new Murray "MP" breakers

Finest protection possible... at competitive prices

- Superior branch circuit protection
- Carries full rated load
- No nuisance tripping • No waiting to reset
- Only two switch positions
- Tungsten silver alloy contacts
- Sturdy plug-in design • Safety trip-free handle
- Backed by full line of "MP" load centers

Murray

Jobs go up faster, easier with minimum wiring runs — and no nuisance callbacks afterwards

How come? Because "MP" breakers are fully magnetic and contain absolutely no limiting thermal element. They work strictly on current alone — not heat.

Think of the profit advantages for you! Now you can put up load centers *anywhere* — near steam risers, oil burners, even in kitchens over stoves — *wherever it's most practical for quick, easy wiring with minimum runs.*

That's not all! Fully magnetic breakers have always provided superior branch circuit protection without nuisance tripping. Advantages to you: no unnecessary callbacks, satisfied customers, repeat business — and finally, additional profits.

Best of all, "MP" breakers — backed by a full line of plug-in "MP" load centers — cost no more than ordinary breakers.

So next time you order circuit breakers, ask for new fully magnetic "MP's" — and see what a difference it makes in your operations. Available now at your Murray wholesaler's.

For more information about "MP" breakers, mail coupon today!

Murray Manufacturing Corp., 1250 Atlantic Avenue, Brooklyn 16, N.Y. Dept. ES-3

Please rush me: ☐ full information on new "MP" line ☐ new 1958 Murray Catalog.

Name .....

Company .....

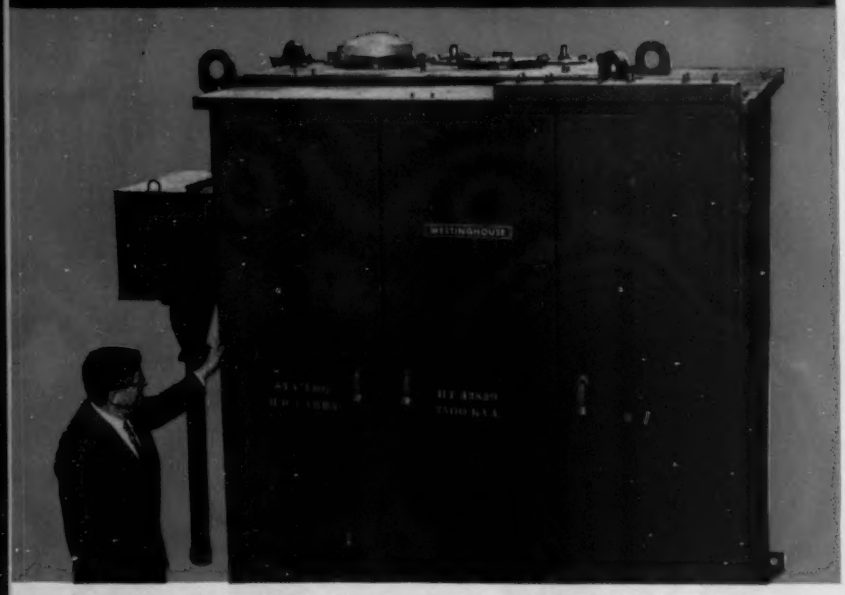
Address .....

City ..... State .....

Type of business .....

Ask your Westinghouse representative
about the exclusive benefits you get from

CONTACT-FREE
MAGAMP CONTROL WITH
MAINTENANCE-MISER DESIGN...
BASIC FEATURE FOR
ATTENDANT-FREE SUBSTATIONS



San Diego Gas and Electric Company's attendant-free substation serving San Diego Junior College at Balboa Park is equipped with trouble-free Westinghouse Magamp control.

Attendant-free substations demand maintenance-free components. When Westinghouse load tap changers are used on a CSP® power transformer, load tap changing substations transformer or station-type voltage regulator, there too is found the contact-free Magamp* control.

Magamp control, with Maintenance-Miser design for both the primary relay and time-delay relay, assures you of the economic advantages of trouble-free service from your attendant-free substations. Here's why:

- No moving parts to clean and adjust.
- No contact to check and burnish.
- Relays never need to be rebalanced.
- "Set-and-forget" control never needs adjustment.

Call your Westinghouse representative for the complete story of how you can improve your power distribution economics with attendant-free substations equipped with Magamp control . . . another example of how PLOWBACK OF EARNINGS into research and development is helping you meet the increasing problems created by America's electrical growth.

*Trade-Mark J-70874

YOU CAN BE SURE...IF IT'S Westinghouse

Low in maintenance and first costs, the pneumatically operated switch can accommodate virtually any scheme of remote or automatic operation.

The air cylinder, although usually located in the switch enclosure, may be located at any point outside the cabinet enclosure for special applications.

The manual operating handle, normally used only during emergencies when the switch is pneumatically operated, is removed from the operating mechanism and bolted to the enclosure. A key interlock system safeguards against accidental manual operation of the switch when it is under pneumatic control.

For additional data, ask for item U-909, using the coupon on page 121.

One-piece connection makes connectors easy to install

ANDERSON ELECTRIC Corporation, 700 N. 44th St., Birmingham, Alabama, has added two new sizes to its line of Mid-Span Connectors. These two new sizes are both phase connectors and are designed for use with triplex or cabled secondaries.

The new connectors are recommended for either open wire or triplex Mid-Span Secondary Tap-offs. The Mid-Span Phase Connector takes #8 to 1/0 ACSR Main and #8 to #2 ACSR Tap with the MSP-2 having 2 taps and MSP-4 having 4 taps.

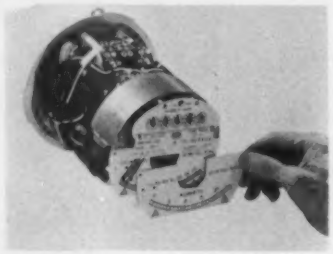
The clamp is of a one-piece, one-bolt design completely enclosed by a heavy plastic cover which clamps tightly to the insulated main cable. Large area contacts and corrosion proof hardware are provided by the use of stainless steel Allen head bolts and stainless steel pressure bars.

An insulation stripping gauge is incorporated on the cover so that taps can be made up and installed without disassembly of the plastic cover.

For additional data, ask for item U-910, using the coupon on page 121.

Thermal meter designed for future load growth

A NEW LINCOLN Type PW combination meter has been introduced by Sangamo Electric Co., Springfield, Illinois. This polyphase watthour/watt thermal demand meter has a special dual range feature which makes it a logical choice for installa-



tions where future load growth is anticipated. The dual range feature permits doubling the capacity of the thermal demand element by simply changing the position of two conveniently located link-connectors and interchanging the demand scales. It is not necessary to recalibrate the meter when changing its range.

Class 100 meters are available with dual demand ranges of 24 and 48 kw, while Class 200 meters have ranges of 48 and 96 kw. Meters are also available with universal scales and multiplier plates marked according to the selected range. The terminal link assembly is positively identified to show range of operation.

For additional data, ask for item U-911, using the coupon on page 121.

Tensioner gives economy and safety of tension stringing

A COMBINATION Tension Stringing Machine and Straddle Reel Dolly that carries its own reel and also pays out the wire under controlled tension is announced by the Petersen Engineering Co., Inc., Santa Clara, California.

The new tensioner is extremely low in price—having been especially designed for use in small areas where capital expenditures must be kept to a minimum and at the same time the economy and safety of tension stringing is desired.

Known as the Pengo Model 5000-STR-1, it takes reels up to 34" x 72" weighing up to 5,000 pounds and employs the same Neoprene-lined bullwheels as do all other 5000 series Pengo Tensioners which permits stringing all kinds and sizes of conductors up through .96" diameter (556,500 cm) under continuous tensions up to 2,000 pounds.

For convenience in changing wire sizes between jobs, a hand rewind device, incorporated into the machine, permits one man to wind the conductor back off the bullwheels or to wind back any amount of wire left at the end of a pull. Stringing of the conductor is possible with one machine instead of two and, consequently, by one man instead of two.

For additional data, ask for item U-912, using the coupon on page 121.

New transformers are light and easily maintained

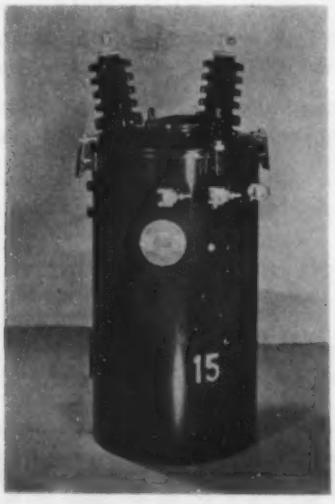
A COMPLETELY redesigned line of single phase pole type distribution transformers in sizes from 3 to 167 kva, 18 kv and below, has been developed by Moloney Electric Company, 5390 Bircher St., St. Louis 20, Mo.

These new transformers have improved electrical characteristics, lighter weight, and are easily maintained.

The improved electrical characteristics were obtained by the use of a new core and a new coil. The new core has every air gap bridged, thereby effecting a reduction in exciting current. The new coil has different proportions giving lower impedance and lower losses, resulting in improved regulation and higher efficiency.

A new core-and-coil framing structure rigidly holds the unit in position under all conditions of handling and operation. The redesigned bushings are internally clamped and have connectors which are tin-coated and large enough for ACSR conductors.

For additional data, ask for item U-913, using the coupon on page 121.



MAGAMP CONTROL . . . PREFERRED BECAUSE:

Mr. C. D. Mack, Electrical Maintenance Supervisor, San Diego Gas and Electric Company, sets control of attendant-free substation serving San Diego Junior College.

Here are the "plus" features that have made Magamp* control the preferred control:

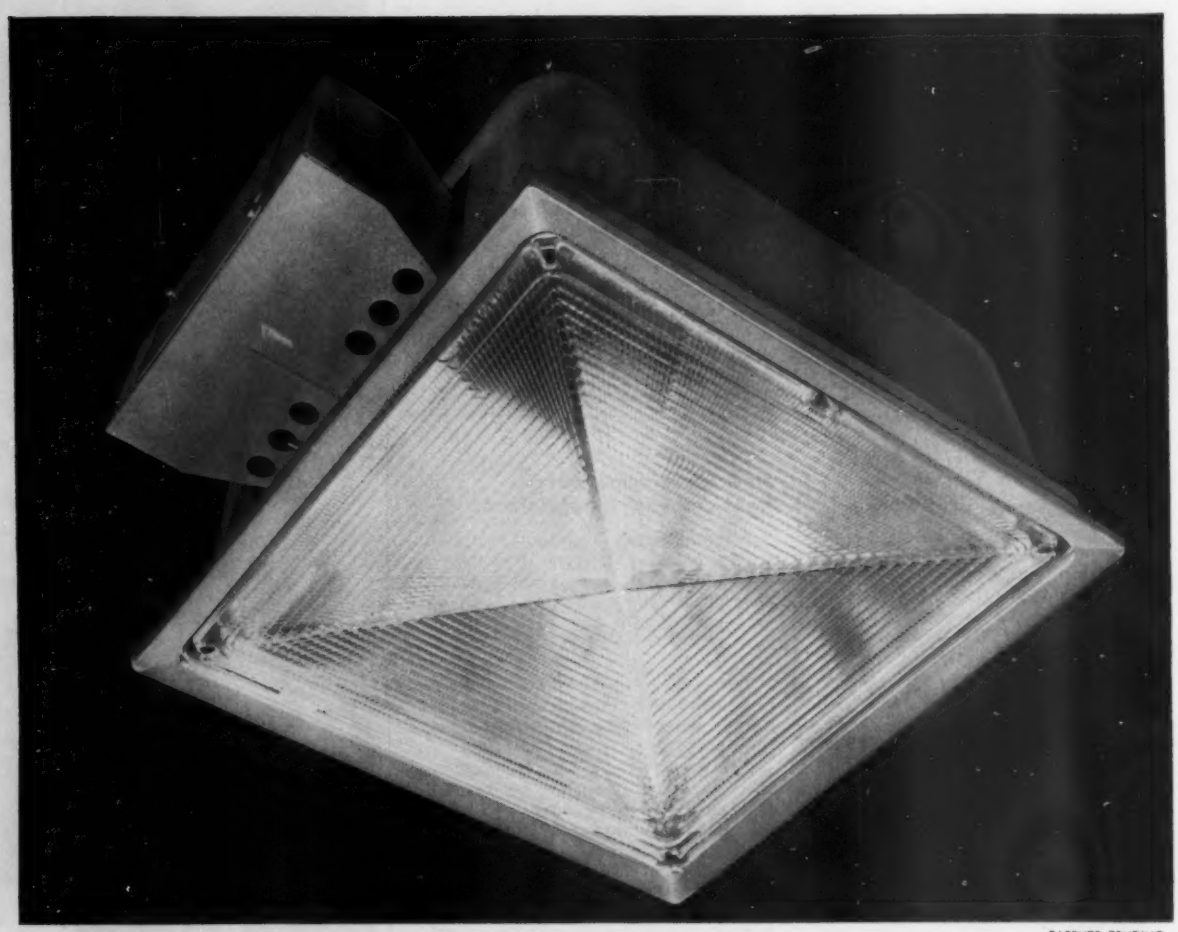
- Completely static — no moving parts in either sensing or timing devices.
- Complete stability after setting.
- All control setting is electrical.
- ASA Class I accuracy.

. . . And only Westinghouse load tap changers have Magamp control. J-70875

*Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse

ELECTRICAL ENCLOSURES STEEL or



PATENTS PENDING

NEW DAY-BRITE

UNI-FRAME

fits every lens box application...beautifully!

New THINcandescent design! Single, narrow, tapered frame fits flush with plaster or acoustical tile for happy blending of light and ceiling. No plaster frame needed.

New modular light pattern! Prismatically-accurate Pyrex* lens is largest available for 12" lens box. Equalizes light distribution over square area. No light leaks.

New flexibility! One box size, in two look-alike series, accommodates any medium-base lamp (100-300 watts). Choice of three finishes: white enamel, aluminum or brass.

For additional information about UNI-FRAME, call your Day-Brite representative listed in the Yellow Pages. Or write...

Day-Brite Lighting, Inc., 6264 N. Broadway, St. Louis 15, Mo.
Day-Brite Lighting, Inc., of Calif., 530 Martin Ave., Santa Clara, Calif.

DECIDEDLY BETTER
DAY-BRITE
LIGHTING FIXTURES

*Registered trade name of Corning Glass Works

Z-419 © Day-Brite Lighting, Inc. 1958

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

ELECTRICAL ENCLOSURES

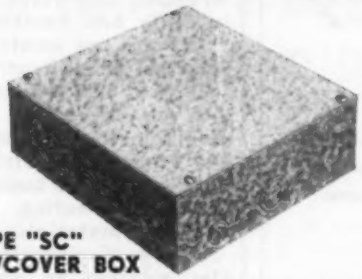
STEEL or ALUMINUM

Contractors, Industrials, Utilities, Municipalities, REA's

CABINETS AND BOXES

TYPE "PF"
TELEPHONE CABINET

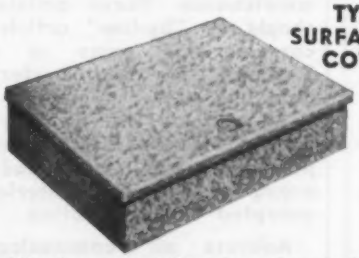
Surface or Flush Mountings in either galvanized or grey enamel finish. Constructed from the finest steels available, all in compliance with the Underwriters Laboratories specifications.



TYPE "SC"
SCREWCOVER BOX

Durable Formed Construction, galvanized or grey enamel finish, with or without knockouts. Sizes to your specifications.

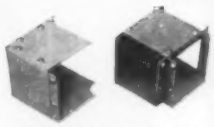
TYPE "A"
SURFACE HINGE
COVER BOX



All sizes available for electrical cutouts, switches, relays, junction and pull box applications, galvanized or grey—with or without knockouts.

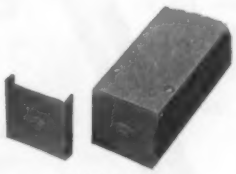
WIREWAYS and DUCT

TYPE "SD" SCREW COVER
AUXILIARY GUTTERS



ELBOW and TEE

"U" CONNECTOR



END CAPS

For Switches, Panel Boards or Straight Runs, you can't match the flexibility, greater capacity and easy installation of B&C wireways. Die formed construction of heavy gauge sheet steel, as specified by the Underwriters Laboratories and the National Electrical Code.

HINGED COVER WIREWAYS

TYPE "HCW"
2½ x 2½, 4 x 4, 6 x 6
1 to 5 foot lengths

ALL ASSOCIATED FITTINGS AVAILABLE
Steel Protection of Electric Conductors, plus Accessibility

Economical to install and maintain — tapping, splicing, additions, inspections, may all be made within the limitations of the National Electrical Code.

Write for descriptive catalog containing installation data and current price list.

B and C

Your Seal of Dependability and Safety

METAL STAMPING COMPANY

590 MEANS ST., N. W. • ATLANTA, GEORGIA

PUT 'EM DOWN BY MACHINE
to cut anchoring costs!

Many utilities have found that anchor installation time and costs can be cut to the minimum by installing Chance Screw Anchors with their hole boring machines. They use the Chance "Blackfoot" because its special features—correct blade pitch, small hub, large thimbleye—were designed for use with boring machines. These features also mean greater holding power and easier installation of these anchors when they are screwed down by hand.

the CHANCE "BLACKFOOT"*

*the line crew's name for the line crew's choice.

–King-size thimbleye accommodates big turning bar or boring machine adaptor.

–Smaller hub means less earth disturbed during installation. Adds to holding power.

–Blades are accurately "pitch-controlled" for fast-cutting, speedy installation.

Chance Screw Anchors are available in sizes from 4" to 15" in diameter. You can get them from stock from your anchor distributor.

. . . and there are CHANCE ANCHORS
for all other soil and guying conditions . . .

CA58-5

A·B·CHANCE CO· CENTRALIA MISSOURI

(A·B·CHANCE CO. of Canada, Ltd., Toronto)

Wanted: Manuscripts for publication

The editors of Electrical South will welcome contributions from the field for publication. Electrical contractors, consulting electrical engineers, light and power company engineers, and others closely associated with the electrical industry are invited to submit articles, photographs, and drawings relating to important and interesting electrical projects in South and Southwest.

Articles are wanted in two principal classifications:

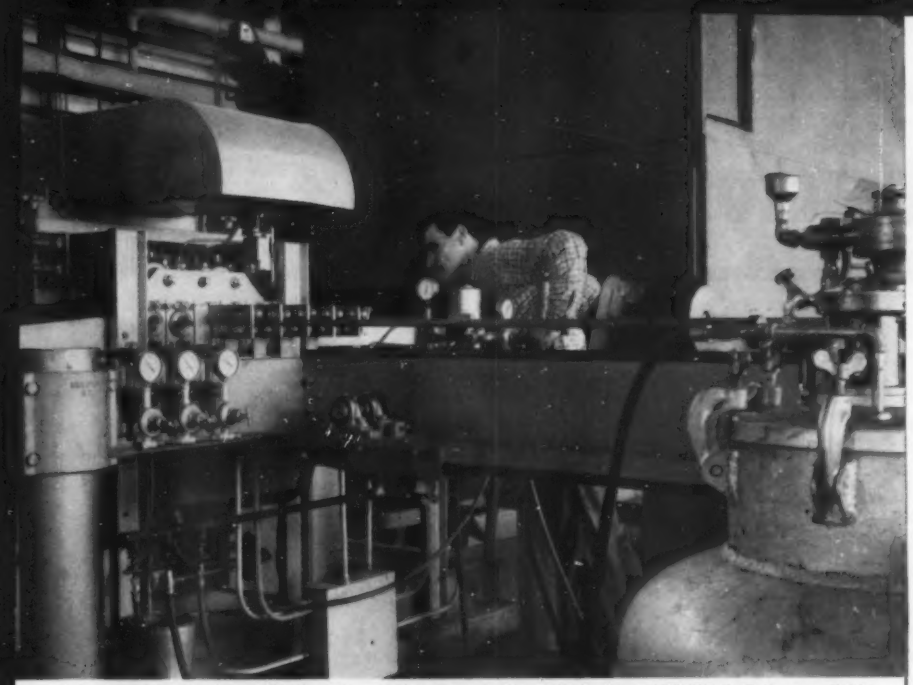
***Wiring and Lighting:* Articles on interesting and unusual electrical installations; any phase of electrical contracting such as business promotion, estimating, handling men and materials, etc.**

***Utility Engineering:* Articles relating to any phase of transmission, distribution, and metering, including design, installation, testing, and maintenance. These articles should be "by-line" articles carrying the name of a Southern or Southwestern light and power company.**

All articles will be given careful consideration and payment will be made promptly for all material accepted for publication.

Address all communications to the editor:

Electrical South
806 Peachtree,
Atlanta 8, Ga.



Here operator checks application of special lacquer coating which gives CIRTUBE EMT its easy fishing.

The fishing's easier, too with new CIRTUBE* EMT

PULLING wire through carelessly made, ordinary EMT often proves an annoying, time consuming business.

The answer isn't just a slick inside surface—what's needed also is a sort of built-in lubrication that helps conductors glide smoothly through long runs.

CIRTUBE EMT is made that way—with a baked-on protective inner coating containing wax-like ingredients in a special formula—always carefully applied to give the same easy fishing each time.

Here are other reasons why CIRTUBE EMT is always so easy to fish: clean, snag-free finishing is one; induction welding is another. This superior welding technique leaves no flash or bead to interfere with wire pulling.

Easy fishing is only one of many reasons why CIRTUBE EMT has won such quick acceptance. Give it a try next time you order—you'll like working with it. Now at your Circle wholesaler's. *Trade Mark

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PLANTS: Maspeth and Hicksville, N. Y. **SALES OFFICES & WAREHOUSES:** In all principal cities

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Proper steel plus! The best cold rolled steel plus the right handling give CIRTUBE EMT its natural bendability.

Split-free, bead-free! Induction welded CIRTUBE EMT, left, proves stronger than ordinary EMT, provides easier fishing.

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Lifetime exterior finish! Hard galvanized finish for durability; polished satin lustre for lasting good looks.

Tight, easily handled bundles! Bright, orange tapes hold CIRTUBE EMT securely for easy handling on and off the job.

Fast, friendly service! Well-known Circle service through a nation-wide network of well stocked nearby warehouses.

Contractors tell how

Standards must remain high in spite of recession

By Samuel W. Rothman
S and L Electric Co., Inc.
Washington, D. C.

◆ IN A DECLINE of business such as electrical contractors now face, we are taking a long range approach to the future upturn that we know will reappear. For the present we look upon survival as dependent upon caution in buying. We are buying only what we need for the job in hand and only as much as we need. No one is going to persuade us to buy beyond immediate needs for we think it would be disastrous to build up an inventory. At the present time we have the lowest inventory in our history.

With the fine cooperation we are getting these days from suppliers whose maintenance of large inventories, showrooms, and excellent delivery right to a job help us give our customers better service and keep our own businesses going, we feel that wholesalers are making every effort to keep their customers in business. We stick to one wholesaler.

We believe it to be a shortsighted view on the part of contractors who are shopping wholesalers for price, taking on below-cost jobs, and price-cutting themselves into sub-standard workmanship. As businessmen, contractors must know that wholesalers are entitled to a legitimate profit and have to obtain their profit from somewhere. If a contractor gets an extra 50 cents off on an item, he surely must know that the wholesaler is going to make it up on another item.

We contractors know only too well that there are no bargains. Therefore, S and L is practicing loyalty to one wholesaler who will stand by us with his full support.

It is self-destroying for a contractor to cut prices below his cost to get a job. He is impairing a price structure that he will have a hard time re-establishing when the storm blows over. Advancing his prices later will not find ready acceptance among his customers. Furthermore, by cutting prices he is now putting himself in debt. As he goes along he will find himself deeper and deeper in the hole. His credit will not be renewed, and ultimately he will have to go out of business. What will he have gained?

We are determined to maintain standards, prices, and policies that S and L Electric has become known for. We have retained our two skilled mechanics, and our same rates of $7.50 per hour per man plus materials and taxes; we will not take on below-cost jobs. We regard good pay for our two skilled mechanics as investment and a guarantee in competence and company reputation. We are not going to sacrifice skill for cheap labor to meet lower prices on jobs and consequently lower our standards.

This seems to us the way of survival as we still hold out on our 24-hour service seven days a week.

Skilled mechanics are an investment in competence and a company's reputation. Here, an electrician and apprentice check on service equipment in an apartment building where a heavy-up was needed.

Grounding-type receptacle needed on all appliances

By C. W. Houston
C. W. Houston Co., Inc.
Rockville, Md.

◆ I WOULD LIKE to see manufacturers install a grounding-type of cord and plug on all appliances.

Electricians are now held responsible for this unit and take care of it when they are called to install air conditioning, washers, dryers, etc. But so often people go out and buy a piece of equipment or an air conditioner, plug it in, and if there is a short, a shock follows.

I would like to see manufacturers replace the present 2-wire system with its added piece of wire for the grounding receptacle with a three-wire ground-type cord. Appliances would then become automatically grounded when plugged in. Ground wire would not come loose, get broken or lost. Hazards would be eliminated and the public more adequately protected.

Obstacles that stand in the way of the electrical apprentice

By Lawrence M. Bichell
Editor
Electrical Contractors News
L. M. Bichell Co.
Washington, D. C.

◆ THE PROBLEM of recruiting promising young men to our growing electrical industry is becoming more acute. While the advantages of electrical living are being widely promoted by all the means of communication reaching the public, the ranks of the electrician doing the wiring are not keeping apace. While the electrical industry competes as an occupation with other fields for a young man's attention and interest, obstacles placed in the way of the electrical apprentice deter him from continued application in the field, and slow up his advancement and self-fulfillment.

We look upon the licensing of electrical apprentices as an obstacle. We believe very firmly that licensing of apprentices should be ended in the District of Columbia.

It impedes the industry in attracting young blood. The plumbing trade which certainly deals with matters of public health and safety is not burdened with such a requirement.

Apprentice licensing

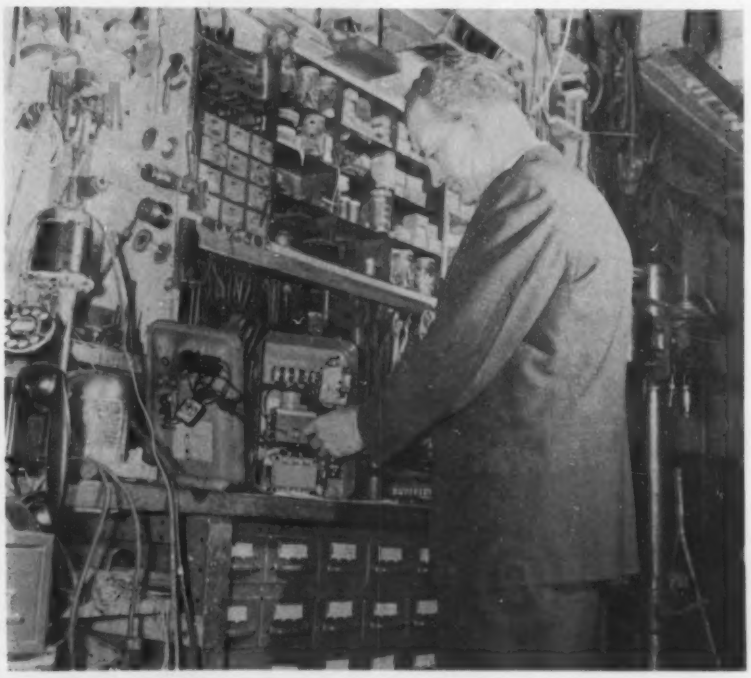
While we do not think it advisable to change the time-honored four-year term for apprentices, we would like to see District authorities drop the regulation that apprentices be licensed. This point of view has been presented editorially in our newspaper by my predecessors and is still representative of our reader contractors.

In the District of Columbia an apprentice may not work alone on a wiring job. Regulation states that he must be accompanied practically every minute by a journeyman or master electrician. During the first year of apprenticeship this is an understandable practice. But after this first year the skillful and ambitious apprentice wishes to be rewarded commensurate with his growing ability. However, if a journeyman companion overseeing his work at every step must also be paid by a contractor, an adequate increase may not be readily forthcoming. The apprentice senses the irony of being supervised while screwing bulbs into 500 sockets in an apartment house.

The apprentice moreover suffers a loss of time and inconvenience in licensing, renewals, reports of every change of employer, and other red tape connected with licensing. There is logic to his thinking when he asks why he needs a license if he is to be watched at every step. Reporting this to his friends, he is not likely to draw new recruits to the electrical field. In short, many of the difficulties imposed by licensing on an electrical apprentice are so overwhelming that frustration turns many to other more satisfying and lucrative occupations. White collar jobs claim some, the expanding field of electronics others.

As long as master electricians are licensed, we see no need for licensing apprentices, or journeymen for that matter. If the licensing of apprentices was removed, it would be easier to recruit help. Moreover, we would be able to put men to work immediately.

When the District authorities redraft new electrical licensing and bonding regulations and the proposed regulations come up for public hearing before adoption, we along with many contractors and contractor organizations will appear and appeal for an end to the licensing of apprentices.



Lawrence M. Bichell, editor of Electrical Contractors News, in his shop in Washington D. C. Here he checks a thermostat's controls.

Detailed work plan pays off in greater efficiency

Si Bell
President
Sarasota Electric Corp.
Sarasota, Florida

◆ BY PROVIDING our mechanics with a detailed, comprehensive sketch in addition to the job blue prints, plan or specs, we've stepped up the efficiency of our operation by 20 per cent!

My time is too valuable to take a man out by the hand and go over every detail of the job with him. On the other hand, I don't want our men doing the engineering or layout for me.

Consequently, time spent on the drawing board saves time on the job. We've abandoned verbal orders and verbal descriptions in favor of a practical drawing of the installation so detailed that it is impossible for any misunderstandings to creep in. Furthermore, the materials our storeroom man supplies, based on the drawing he sees, are of such a style and nature and in such quantity, that the job must turn out exactly the way it was planned.

Such a plan must not be too complicated, yet it must leave nothing to chance. If a piece is a complex angle iron fabrication designed as a fastening, we supply a detail drawing. The plan contains a schematic drawing, and distances between fixtures are indicated to save a mechanic's time handling a ladder and a lengthy tape.

The plan shows the size wire, placement of components, right down to the last screw or bushing, because a mechanic may otherwise omit some detail that will hold up inspection or completion of a job and cause resultant call-backs. The plan even details questions to be asked the carpenter such as whether he has installed wood fillers in the ceiling so we'll have no trouble when the time comes to hang fixtures.

It happens at times that a foreman may give instructions that the mechanic may not fully comprehend and is diffident about questioning. Via a detailed plan, the mechanic gains a full understanding of the job's various parts, along with a mental picture of the job in its entirety.

By making up such a detailed plan and visualizing its problems of installation, we're often able to uncover operating economies. For example, when we wired a trailer park, plans called for placement of feed lines atop poles. By running them lower down, later expansion permitted additional lines to be carried across the top.

Similarly, when we wired a job that required digging a 1,000 foot trench, we pointed out to the owner the wisdom of altering his plans in order to install a heavier cable to provide the needed line capacity for a series of cottages which he planned to air condition later. In addition, we sold him on the idea of adding more outlets for future expansion.

We attempt to design jobs the way our experience tells us they should be done. The cost will be higher at times, but we're safeguarding the customer against greatly-increased costs later if expansion should be required. He won't forget your concern for his electrical welfare.

In such cases, while we submit a basic estimate under the original plan. After detailing the benefits of our revised plan and proposed changes, we also submit an alternate estimate.

The more hard-headed a businessman the customer is, the easier he's convinced that a little more money spent at the moment to include our suggested changes will save him future expense and woe, and you've thus earned his confidence for keeps.

Display helps sell wiring

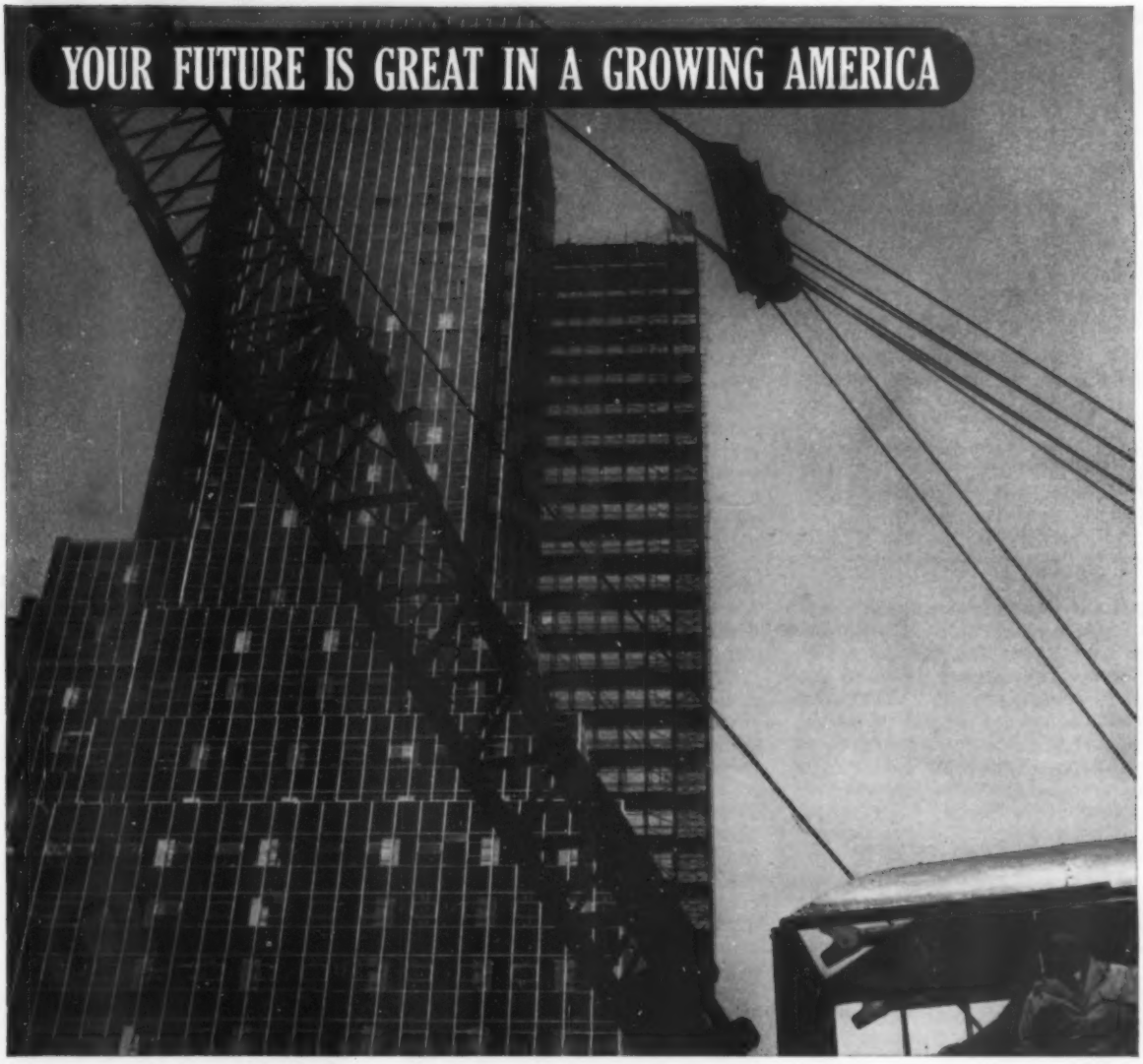
By D. M. Lefler
Secretary-Treasurer
Cox Electric Co., Inc.
Stuttgart, Ark.

◆ DURING THE CURRENT slow tempo of business, when we contractors in the smaller cities need all the volume we can develop, our organization is cashing in on an attractive show room and displays that point up electrical wiring services that almost any householder can use.

At this time, we're turning attention to outdoor lighting. This is somewhat in the luxury class, and the average homeowner can do without it. Most of them will fore-

(Continued on page 115)

This counter display, seen by everyone who comes into the showroom, helps to sell outdoor lighting that averages $40 per job.



AMERICA ALWAYS OUTPERFORMS ITS PROMISES

We grow so fast our goals are exceeded soon after they are set!

7 BIG REASONS FOR CONFIDENCE IN AMERICA'S FUTURE

1. More People—Four million babies yearly. U. S. population has *doubled* in last 50 years! And our prosperity curve has always followed our population curve.

2. More Jobs—Though employment in some areas has fallen off, there are 15 million more jobs than in 1939—and there will be *22 million more* in 1975 than today.

3. More Income—Family income after taxes is at an all-time high of $5300—is expected to pass $7000 by 1975.

4. More Production—U.S. production *doubles* every 20 years. We will require millions more people to make, sell and distribute our products.

5. More Savings—Individual savings are at highest level ever—*$340 billion*—a record amount available for spending.

6. More Research—*$10 billion* spent each year will pay off in more jobs, better living, whole new industries.

7. More Needs—In the next few years we will need more than *$500 billion* worth of schools, highways, homes, durable equipment. Meeting these needs will create new opportunities for everyone.

Add them up and you have the makings of another big upswing. Wise planners, builders and buyers will act *now* to get ready for it.

FREE! Send for this new 24-page illustrated booklet, "Your Great Future in a Growing America." Every American should know these facts. Drop a post card today to: THE ADVERTISING COUNCIL, Box 10, Midtown Station, New York 18, N. Y.

Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

- Electrical Contractors ✔
- Electrical Utilities ✔
- Electrical Wholesalers ✔
- Electrical Inspectors ✔
- Industrial Engineers ✔
- Consulting Engineers ✔

◆ LAST MONTH we completed our discussion on services of 600 volts or less. There are not as many high-voltage services as there are low-voltage services. Yet, the trend is toward higher voltages, and everyone connected with electrical installations is subject to being faced with an installation of over 600 volts.

High voltage services

This month we will turn our attention to the Code requirements for these higher voltages as they pertain to services. We will also begin in this issue our study of overcurrent protection.

In addition to the special requirements for high-voltage services, section 2386 lists also as mandatory for high voltage several of the sections which applied to the lower voltages. In other words, most of the requirements which we have already discussed apply to both low and high-voltage services. It may be more enlightening, therefore, to call attention briefly to some of the sections which do *not* apply to the higher voltages.

The principal sections which are excluded are those governing electrical metallic tubing, low-voltage cables, service heads, terminations of conductors, connections ahead of the disconnecting means and overcurrent devices, ratings, location of devices, and relative arrangement of devices. This indicates that the rules already discussed about the requirements for disconnecting means, the number and grouping of such disconnects, etc., are also required for higher voltages but that more stringent rules apply to the type and method of wiring as well as to the equipment used. Potheads, for instance, as an example of this stringency, would replace weatherheads.

Service categories

There are several categories into which the Code divides the services which exceed 600 volts. These categories are roughly as follows: (1) **voltages** (a) not exceeding 2,500, (b) not exceeding 15,000, (c) not exceeding 25,000, and (d) by implication, over 25,000; (2) **location of disconnects** (a) inside of a vault and (b) outside of a vault; (3) **accessibility** (a) to qualified persons only and (b) to other than qualified persons.

The rules governing each of these categories, with one exception, apply only to the secondaries and not to the primaries under the following conditions: When the

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Code test questions:

1. Primary conductors are regarded as constituting the service conductors to the building proper when they enter a utility company vault located within the building. True or false?

2. If the voltage exceeds 5,000 volts between conductors, they shall be lead-sheathed. True or false?

3. If open service conductors of 13,800 volts are employed where not accessible to other than qualified persons, they shall be rigidly supported on glass, porcelain, or other approved insulators which will keep them not less than 3 inches from the surfaces wired over. True or false?

4. Where lead-sheath conductors having 4,160 volts between conductors emerge from the lead-sheathing, they shall be protected from moisture and mechanical injury by varnished cambric tape or other approved high-voltage tape applied evenly to a thickness not less than the thickness of the original insulation. True or false?

5. Service cables of over 600 volts shall be not smaller than No. 6. True or false?

6. Fuses used for overcurrent protection on services of over 600 volts, if not in a vault, shall have an interrupting rating.

(a) at least equal to the maximum short-circuit current possible in the circuit.

(b) at least equal to the rated circuit load.

(c) not in excess of the rated circuit load.

Which is correct: a? b? c?

7. Circuit-breakers, when used on services of over 600 volts, when not in a vault, shall be of the:

(a) moulded-case type.

(b) non-inductive type.

(c) trip-free type.

Which is correct: a? b? c?

8. Conductors of over 15,000 volts between conductors:

(a) shall not be run outside of buildings.

(b) shall not be run outside of buildings unless encased in 2 inches of concrete.

(c) shall enter a transformer vault.

Which is correct: a? b? c?

9. Open service conductors accessible to other than qualified persons shall be kept at least:

(a) 8 inches apart.

(b) 2 inches apart.

(c) 3 inches apart.

Which is correct: a? b? c?

10. On services of over 600 volts, lightning arresters, if required by the authority enforcing the Code, shall be placed:

(a) in each underground conductor.

(b) in each underground overhead conductor.

(c) in the grounded conductor.

Which is correct: a? b? c?

Correct answers will be found at end of article. *(See page 115)*

step-down transformers are (1) outdoors, (2) in a separate building, or (3) in a vault approved for the purpose under the sole jurisdiction of the utility company. If the secondary disconnecting means is also in the vault and accessible to a qualified person other than a representative of the utility company, the rules would apply to such secondary equipment only and not to the transformers or to the primaries. (Such primaries are not directly connected to the service. They are electrically connected through the transformers, but not directly or physically connected.)

The one exception referred to above as applying to primaries is the rule requiring conductors of more than 15,000 volts between them to enter a transformer vault. If the vault cannot be entered directly from outside or from underground, the conductors must be installed in a conduit or duct which is encased in not less than 2 inches of concrete or brick where such conductors pass through other parts of the building before reaching the vault. When thus embedded in masonry, they are considered as being outside of the building. This is an exception only in the sense that it would govern utility company primaries as well as conductors not under the sole control of a utility company. This is a very important rule.

Not only is it important to confine voltages in excess of 15,000 to vaults and masonry-encased conduits, but it is difficult to imagine instances where higher voltages would be used within a building. That is why it is so confusing to read this rule in the Code and then, on further reading, be confronted with additional Code rules pertaining to even higher voltages. Section 2389-a-2 lists a certain non-automatic switch together with suitable fuses as being a permissible overcurrent device for voltages of 25,000 or less. Although higher voltages are not mentioned, neither is there a definite limit set, and hence, by implication, voltages higher than 25,000 are permissible if suitable protective devices and installation methods are used. And that is indeed the case.

Rules become outmoded

Long experience with a rapidly growing industry has impressed upon the Code-making authorities the folly of hard and fast rules which sometimes become outmoded by the development of new products and installation methods. Instead of a maximum limit, therefore, to the voltage permitted, the Code authorities have said such things as, "Circuit conductors shall be suitable for the voltage and the conditions under which they are installed," section 7105; "The type of enclosure used in a given case shall be designed and constructed according to the nature and degree of the hazard(s) associated with the installation," section 7120; "They (transformers and vaults) shall be located and arranged to minimize possible life and fire hazards," section 4511; "Motors operating at more than 7,500 volts between conductors shall be installed in fire-resistant motor rooms," section 4422; "Service conductors and their supports, including insulators, shall have strength and stability sufficient to insure maintenance of adequate clearance with abnormal currents in case of short circuits," section 2387-d.

Edison opposed alternating currents and the higher voltages because he considered the high voltage unsafe and considered the need for transmitting high voltages from one location to another as utterly ridiculous. A few years ago, a motor operating above 7,500 volts was considered ridiculous by many people, yet there are 12,000-volt motors operating today in such hazardous locations as oil refineries.

Today, except for unusual and rare instances, utilization voltages in excess of 15,000 volts inside of a building seem ridiculous, and even distribution voltages within a building in excess of 15,000 volts seem unnecessary to me. But the Code has no such restrictive limits. On the other hand, the Code rules governing the installation of wiring and equipment for the various voltage values are restrictive to the point of safety, and they are definite.

Wiring methods

The wiring method is required to be rigid conduit or approved high-voltage cable in duct encased in masonry. If not accessible to unqualified persons, such as in a vault, open wiring on approved insulators are acceptable with 8 inches between conductors and 2 inches from the surface on which the insulators are mounted for voltages not exceeding 2,500 and a minimum of 3 inches for over 2,500. The minimum size is No. 6 for single conductors and No. 8 for assembled cables.

The Code requirements for the disconnecting means and overcurrent devices on these higher voltages are, of course, much more strict than on the lower voltages. But one important feature of the rules is that the Code, beginning with the 1947 issue, has recognized metal-enclosed switchgear as offering protection equivalent to that offered by vaults. Needless to say, the high-voltage services installed today are predominantly of the metal-enclosed type.

Such metal enclosures, to so qualify, must be of steel at least ⅛ inch in thickness over all four sides and over the top of a steel supporting structure of ample strength and rigidity. Protection is also required at the bottom of the structure if it is installed over a wood floor. Usually, of course, it rests on a concrete slab.

If the disconnecting switches and the overcurrent devices are not an integral part of a metal-enclosed switchgear assembly and are installed in a vault, they may consist, for voltages not in excess of 15,000 volts, of oil-filled, removable section cutouts, or of oil-filled fuses which are hinged on the bottom for operating as a switch by means of a "hot stick"; or they may consist of a switch capable of opening the no-load current of the transformers and suitable fuses provided that the switch is interlocked with a circuit-breaker in the secondary circuit in such a way that it cannot be opened when the circuit-breaker is closed. Or an automatic - trip circuit - breaker may be used.

If the equipment is installed in a vault and the voltage does not exceed 25,000 volts, a fused non-automatic switch which is capable of interrupting the rated load may be used, or an automatic-trip circuit-breaker may be used. No higher voltages are specified.

But the Code states, " . . . if these limitations are exceeded, an automatic - trip circuit - breaker shall be installed in compliance with the requirements of . . . " equipment not in a vault or not of the metal-enclosed type. Presumably, the "limitations" referred to are the 15,000 and 25,000 voltage values. In other words, the Code is saying that for voltages exceeding 25,000 volts, a circuit-breaker would be required even in a vault which met all of the safety requirements for a breaker not in a vault for voltages of 25,000 or less.

Important distinction

If not in a vault or not of the metal-enclosed type, fuses must be capable of interrupting the *maximum short-circuit possible*. This is in contrast to the requirement, when in a vault, that they be capable of interrupting the *rated current of the circuit*. The difference is tremendous. (See this column in the Feb. and March, 1958, issues of ELECTRICAL SOUTH for a discussion of short-circuit currents.)

Circuit-breakers outside of vaults are required to be of the trip-free type or have multiple breakers with a handle for each pole to prevent closing under load.

(Continued on page 114)

Questions on the Code

(Readers are invited to send in questions which they would like to see discussed in this department. Address them to Code Editor, ELECTRICAL SOUTH, 806 Peachtree St., NE, Atlanta 8, Ga.)

Control circuits

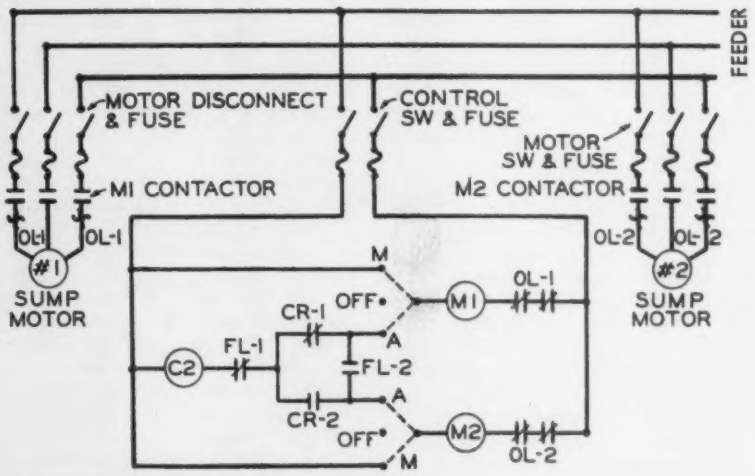
Question: I have been asked to hook up two sump pumps in such a way that they run intermittently under normal duty, and both at the same time if necessary to remove accumulated water under abnormal conditions. I can do this if I am allowed to use a separate switch and fuse for the control instead of connecting the control wires to the motor starters. Would that type connection satisfy Code requirements?

Answer: Yes, Sections 2403-g and 4372 *require* that control conductors be separately protected except that such conductors are considered properly protected and therefore permitted without separate protection under the three conditions listed under a, b, and c of section 4372. These three permitted exceptions are as follows:

"a. If the rating or setting of the branch-circuit overcurrent device is not more than 500 per cent of the carrying capacity of the control-circuit conductors.

"b. If the controlled device and the point of control (start and stop buttons, pressure switch, thermostatic switch, etc.) are both located on the same machine and the control circuit does not extend beyond the machine.

"c. If the opening of the control circuit would create a hazard; as for example, the control circuit of fire-pump motors, and the like."



Except under certain specified conditions, control conductors must be separately protected. This diagram for a double sump illustrates type of installation discussed in the accompanying Code questions.
Control relay, CR, when energized by float switch FL-1 changes the relation of CR-1 and CR-2 contactors—causing first one and then the other to run. If one pump cannot handle load, float switch FL-2 closes and causes other pump to run at same time. M-off-A switches provide for manual or automatic operation.

If the control circuit is not as described in a, b, or c, or if it is not exempt by Article 725 as a result of a current-limiting supply or low voltage, then it must be separately protected by overcurrent devices not of the time-delay type and not in excess of 500 per cent of the carrying capacity of the conductors. This is frequently done on small control conductors for large motors, and always done on high voltage equipment. Your proposed method, although not required, would certainly satisfy all Code requirements for overcurrent protection for the control conductors.

An installation similar to the one you describe has lingered in my memory perhaps because the wiring diagram for it had been lost. The development of an improvised wiring sketch to fit the existing controls resulted in quite a picnic for a select crowd of "experts" before one out of the many proposed schemes was found to work. The "working" sketch is reproduced here for the convenience of other experts caught without diagrams and also to illustrate the Code question asked. (See sketch.)

Testing grounds

Question: How can I test the resistance of a system ground other than by the complicated, time-consuming methods with expensive equipment usually recommended for such tests?

Answer: The only accurate way to test the resistance of grounding electrodes, to my knowledge, is by means of a ground resistance testing instrument designed for the purpose, or else by means of the voltmeter-ammeter method. The latter method is quite complicated. However, a good check which can be made quickly when the current is on and which in many cases is satisfactory is a simple method used by some inspectors in routine checking, although they still resort to the more exacting methods when necessary. This simple check is made in the following manner:

Open the service switch and disconnect the grounding conductor from the terminal inside the service switch. Then with two lamps connected in series, connect the common lead between the two lamps to a hot terminal in the switch. Connect one of the other test lamp leads to the grounded neutral and one to the grounding wire leading to the electrode. If the resistance is sufficiently low in the grounding electrode, the lamp connected to it will burn at the same brilliancy as the lamp connected to the neutral. If the resistance approaches 25 ohms, the lamp to the electrode will be considerably dimmer than the one to the neutral.

Some inspectors use only one lamp for this test and touch the leads first between the hot point

and the neutral and then between the hot point and the grounding conductor, comparing the relative brilliance as they alternate from one to the other. This method, of course, whether one lamp is used or two, is for quick supplementary checks. Occasional checks in a more thorough manner should be made with ground resistance testing machines, such as the Biddle "Megger" Ground Tester or some other dependable make, especially on jobs which may be involved in an issue with opposing interests. In such cases, the facts must be known accurately, to say nothing of the safety factors involved. The price of such an instrument is small in comparison to its value. In selecting such an instrument, do not confuse the ground tester with the insulation tester. Each has a separate purpose.

Another test which some inspectors have used, and which can be made when the current is on, is dangerous and should not be used. This test is made by means of a fuse and switch. Knowing that some inspectors use this method, I point it out merely to warn against its indiscriminate use, but not to recommend it. It is done by connecting the line side of the switch to the available 120-volt current, connecting the fuse between the load side of the switch and the grounding conductor. The larger the fuse which will rupture, the lower the resistance to ground; but the larger the fuse, the greater the hazard to the person making the test.

Interim amendment issued on hazardous locations

◆ A TENTATIVE interim amendment to the 1956 edition of the National Electrical Code, No. 109, has been released by the National Electrical Code Committee of the National Fire Protection Association.

Effective July 18, 1958, it concerns recognition of Type MI Cable for general wiring in hazardous locations, revising Code Sections 5014, 5015, 5054, 5064, and 5073.

The text of Tentative Interim Amendment No. 109, is as follows:

"To recognize Type MI Cable for general wiring in hazardous locations as indicated in the following revisions, but not to recognize the material for the support of pendent lighting fixtures:

Section 5014.a; Revise to read:

"a. Class I, Division 1 locations, threaded rigid metal conduit or Type MI cable with termination fittings approved for the location shall be the wiring method employed. All boxes, fittings, and joints shall be threaded for connection to conduit or cable terminations, and shall be explosion-proof. Threaded joints shall be made up with at least five threads fully engaged. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings. Where necessary to employ flexible connections, as at motor terminals, flexible fittings approved for Class I locations (explosion-proof) shall be used."

Section 5014.b; Revise first sentence to read:

"In Class I, Division 2 locations, threaded rigid metal conduit or Type MI cable with termination fittings approved for Class I locations shall be the wiring method employed."

Insert a new second sentence to read:

"Type MI cable shall be installed in a manner to avoid tensile stress at the termination fittings."

No change in the last two sentences.

Section 5015; Revise first paragraph to read:

"Seals are provided in conduit systems to prevent the passage of gases, vapors, or flames from one portion of the electrical installation to another through the conduit. Such communication through Type MI cable is inherently prevented by construction of the cable, but sealing compound is used in cable termination fittings to exclude moisture and other fluids from the cable insulation, and shall be of a type approved for the conditions of use. Seals in conduit systems shall conform to the following:"

Section 5054.a; Revise first paragraph to read:

"In Class II, Division 1 locations, threaded rigid metal conduit or Type MI cable with termination fittings approved for the location shall be the wiring method employed. Type MI cable shall be installed and supported in a manner to avoid tensile stress at the termination fittings."

Section 5054.a.1; Change first sentence to read:

"Fittings and boxes shall be provided with threaded bosses for connection to conduit or cable terminations, shall have. . . . . "

Section 5054.b; Revise first paragraph to read:

"In Class II, Division 2 locations, rigid metal conduit, electrical metallic tubing, or Type MI cable with approved termination fittings shall be the wiring method employed."

Section 5064.a.1; Revise this paragraph to read:

"Where accidental damage or breakdown of insulation might cause arcs, sparks, or high temperatures, rigid metal conduit, electrical metallic tubing, or Type MI cable with approved termination fittings shall be the wiring method employed. For conduit or electrical metallic tubing, the number of conductors shall be limited only by the requirement that the cross-sectional area of all conductors shall not exceed 40 per cent of the area of the raceway. Where limited flexibility. . . . . "

Section 5073.a; After "conduit" in the second line, insert: "or Type MI cable."

The release of this amendment to the 1956 edition of the National Electrical Code is in accordance with NFPA policy of keeping its standards up to date in furnishing guidance in the proper installation of equipment and safeguarding of hazards, to further the Association's general objective of reducing loss of life and property by fire.

The amendment, developed under the published Procedure for Tentative Interim Amendments, is recommended by the Committee for application in the administration of the 1956 edition of the National Electrical Code.

It is also included in the proposal submitted by NEC Code-making Panel No. 14 in connection with preparation of the proposed 1959 National Electrical Code.

Electrical South Data Sheets — Series III — Electrical Estimating

New, revised estimating tables continued in this issue

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

JUNCTION & METERING CABINETS "MFG"
SHEET METAL FLOOR MOUNTING (WOOD)

SIZE DEPTH	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
6" x 6" x 4"	.70	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10	2.28	2.45	2.63
8" x 8" x 8"	.97	1.21	1.46	1.70	1.94	2.18	2.43	2.67	2.91	3.15	3.40	3.64
8"x 18"x 12"	1.5	1.88	2.25	2.63	3.00	3.38	3.75	4.13	4.50	4.88	5.25	5.63
12"x 12" x 6"	1.2	1.50	1.80	2.10	2.40	2.70	3.00	3.30	3.60	3.90	4.20	4.50
12"x 12" x 8"	1.3	1.63	1.95	2.28	2.60	2.93	3.25	3.58	3.90	4.23	4.55	4.88
12"x 18" x 8"	1.5	1.88	2.25	2.63	3.00	3.38	3.75	4.13	4.50	4.88	5.25	5.63
12"x 24" x10"	1.9	2.38	2.85	3.33	3.80	4.28	4.75	5.23	5.70	6.18	6.65	7.13
18"x 24" x 6"	1.9	2.38	2.85	3.33	3.80	4.28	4.75	5.23	5.70	6.18	6.65	7.13
18"x 24" x 8"	2.1	2.63	3.15	3.68	4.20	4.73	5.25	5.78	6.30	6.83	7.35	7.88
24"x 24" x 8"	2.5	3.13	3.75	4.38	5.00	5.63	6.25	6.88	7.50	8.13	8.75	9.38
24"x 32" x 8"	2.9	3.63	4.35	5.08	5.80	6.53	7.25	7.98	8.70	9.43	10.15	10.88
24"x 32"x 12"	4.1	5.13	6.15	7.18	8.20	9.23	10.25	11.28	12.30	13.33	14.35	15.38
24"x 36"x 12"	4.3	5.38	6.45	7.53	8.60	9.68	10.75	11.83	12.90	13.98	15.05	16.13
30"x 30"x 12"	4.4	5.50	6.60	7.70	8.80	9.90	11.00	12.10	13.20	14.30	15.40	16.50
30"x 36"x 8"	4.4	5.50	6.60	7.70	8.80	9.90	11.00	12.10	13.20	14.30	15.40	16.50
30" x 36"x12"	4.9	6.13	7.35	8.58	9.80	11.03	12.25	13.48	14.70	15.93	17.50	18.38
36"x 48" x 8"	7.0	8.75	10.50	12.25	14.00	15.75	17.50	19.25	21.00	22.75	24.50	26.25
36"x 48"x 12"	7.7	9.63	11.55	13.48	15.40	17.33	19.25	21.18	23.10	25.03	26.95	28.88
48"x 60"x 12"	8.1	10.13	12.15	14.18	16.20	18.23	20.25	22.28	24.30	26.33	28.35	30.38
48"x 60"x 16"	11.9	14.88	17.85	20.83	23.80	26.79	29.75	32.73	35.70	38.69	41.65	44.63
48"x 72"x 16"	13.8	17.25	20.70	24.15	27.60	31.05	34.50	37.95	41.40	44.85	48.30	51.75
48"x 84"x 16"	15.7	19.63	23.55	27.48	31.40	35.33	39.25	43.18	47.10	51.03	54.96	58.88
48"x 96"x 24"	19.8	24.75	29.70	34.65	39.60	44.55	49.50	54.45	59.40	64.35	69.30	74.25

E-101-B

LABOR: Includes material handling at site, drilling for anchors, setting anchor bolts or screws and installing box. (Add for makeup of taps.)

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JUNCTION AND METERING CABINETS "NEC"
SHEET METAL – 10 FT. MOUNTING HEIGHT ON WOOD

SIZE DEPTH	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.40	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
6" x 6" x 4"	.97	1.21	1.46	1.70	1.94	2.18	2.43	2.67	2.91	3.15	3.40	3.64
6" x 6" x 6"	1.3	1.63	1.95	2.28	2.60	2.96	3.25	3.58	3.90	4.23	4.55	4.88
8" x18" x12"	2.1	2.65	3.15	3.68	4.20	4.73	5.25	5.78	6.30	6.83	7.35	7.88
12" x12" x 6"	1.6	2.00	2.40	2.80	3.20	3.60	4.00	4.40	4.80	5.20	5.60	6.00
12" x12" x 8"	1.7	2.13	2.55	2.98	3.40	3.83	4.25	4.68	5.10	5.53	5.95	6.38
12" x18" x 8"	2.1	2.65	3.15	3.68	4.20	4.73	5.25	5.78	6.30	6.83	7.35	7.88
12" x24" x10"	2.6	3.25	3.90	4.55	5.20	5.85	6.50	7.15	7.80	8.45	9.10	9.75
18" x24" x 6"	2.6	3.25	3.90	4.55	5.20	5.85	6.50	7.15	7.80	8.45	9.10	9.75
18" x24" x 8"	2.8	3.50	4.20	4.90	5.60	6.30	7.00	7.70	8.40	9.10	9.80	10.50
24" x24" x 6"	3.5	4.38	5.25	6.13	7.00	7.88	8.75	9.63	10.50	11.38	12.25	13.13
24" x32" x 8"	4.0	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00
24" x32" x12"	5.7	7.13	8.55	9.98	11.40	12.83	14.25	15.68	17.10	18.53	19.95	21.38
24" x36" x12"	6.0	7.50	9.00	10.50	12.00	13.50	15.00	16.50	18.00	19.50	21.00	22.50
30" x30" x12"	6.3	7.88	9.45	11.03	12.60	14.18	15.75	17.33	18.90	20.48	22.05	23.63
30" x36" x 8"	6.3	7.88	9.45	11.03	12.60	14.18	15.75	17.33	18.90	20.48	22.05	23.63
30" x36" x12"	6.9	8.63	10.35	12.08	13.80	15.53	17.25	18.98	20.70	22.43	24.15	25.88
36" x48" x 8"	10.2	12.75	15.30	17.85	20.40	22.95	25.50	28.05	30.60	33.15	35.70	38.25
36" x48" x12"	11.1	13.88	16.65	19.43	22.20	24.98	27.75	30.53	33.30	36.08	38.85	41.63
48" x60" x12"	11.9	14.88	17.85	20.85	23.80	26.78	29.75	32.73	35.70	38.68	41.65	44.63
48" x60" x16"	17.5	21.88	26.25	30.63	35.00	39.38	43.75	48.13	52.50	56.88	61.25	65.63
48" x72" x16"	20.4	25.50	30.60	35.70	40.80	45.90	51.00	56.10	61.20	66.30	71.40	76.50
48" x84" x16"	23.5	29.13	34.95	40.78	46.60	52.43	58.25	64.08	69.90	75.73	81.55	87.38
48" x96" x24"	29.7	37.13	44.55	51.98	59.40	66.83	74.25	81.68	89.10	96.53	103.95	111.38

E-101-B

LABOR: Includes material handling at site, drilling for anchors, setting anchor bolts or screws and installing box. (Add for makeup of taps).

9-58

JUNCTION CABINETS "CAST"
CONCRETE WALL MOUNTED

UNFLANGED BOXES

SIZE DEPTH	HOURS EACH	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
4" x 4" x2½"	1.7	2.13	2.55	2.98	3.40	3.83	4.25	4.68	5.10	5.53	5.95	6.38
4" x 4" x 4"	1.7	2.13	2.55	2.98	3.40	3.83	4.25	4.68	5.10	5.53	5.95	6.38
4" x 6" x 2½"	1.8	2.25	2.70	3.15	3.60	4.05	4.50	4.95	5.40	5.85	6.30	6.75
4" x 6" x 4"	2.0	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50
6" x 6" x 6"	2.5	3.13	3.75	4.38	5.00	5.63	6.25	6.88	7.50	8.13	8.75	9.38
6" x10" x 4"	2.5	3.13	3.75	4.38	5.00	5.63	6.25	6.88	7.50	8.13	8.75	9.38
6" x10" x5½"	2.8	3.50	4.20	4.90	5.60	6.30	7.00	7.70	8.40	9.10	9.80	10.50
6" x12" x 6"	3.5	4.38	5.25	6.13	7.00	7.88	8.75	9.63	10.50	11.38	12.25	13.13
8" x12" x 6"	4.1	5.13	6.15	7.18	8.20	9.23	10.25	11.28	12.30	13.33	14.35	15.38
8" x18" x4½"	4.0	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00
8" x24" x4½"	4.2	5.25	6.30	7.35	8.40	9.45	10.50	11.55	12.60	13.65	14.70	15.75
12" x12" x 4"	4.0	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00
12" x12" x 8"	4.2	5.25	6.30	7.35	8.40	9.45	10.50	11.55	12.60	13.65	14.70	15.75
12" x18" x 6"	5.9	7.38	8.85	10.33	11.80	13.28	14.75	16.23	17.70	19.18	20.65	22.13
12" x18" x10"	6.5	8.13	9.75	11.38	13.00	14.63	16.25	17.88	19.50	21.13	22.75	24.38
12" x24" x 6"	6.1	7.63	9.15	10.68	12.20	13.73	15.25	16.78	18.30	19.83	21.35	22.88
18" x24" x 8"	7.3	9.13	10.95	12.78	14.60	16.43	18.25	20.08	21.90	23.73	25.55	27.38
18" x24" x12"	10.3	12.88	15.45	18.03	20.60	23.18	25.75	28.33	30.90	33.48	36.05	38.63
24" x24" x 8"	13.1	16.38	19.65	22.93	26.20	29.48	32.75	36.03	39.30	42.58	45.85	49.13
24" x48" x 8"	16.0	20.00	24.00	28.00	32.00	36.00	40.00	44.00	48.00	52.00	56.00	60.00
30" x48" x 8"	20.4	25.50	30.60	35.70	40.80	45.90	51.00	56.10	61.20	66.30	71.40	76.50

E-101-B

LABOR: Includes material handling at site, drilling for anchors, setting anchor bolts or screws and installing box. (Add for makeup of taps.)

9-58

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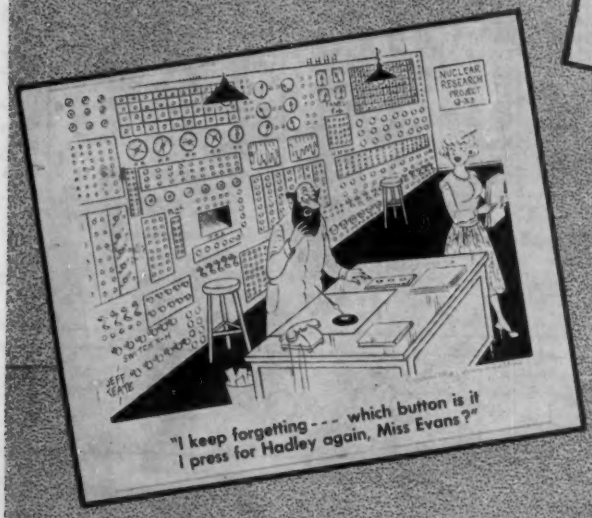
Your Work Can Wait!

"Good afternoon, madam - I represent the Midtown Sales Company...."



"I keep forgetting - - - which button is it I press for Hadley again, Miss Evans?"

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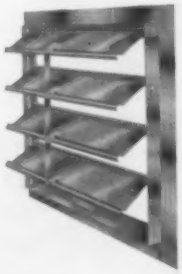

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Free CATALOG

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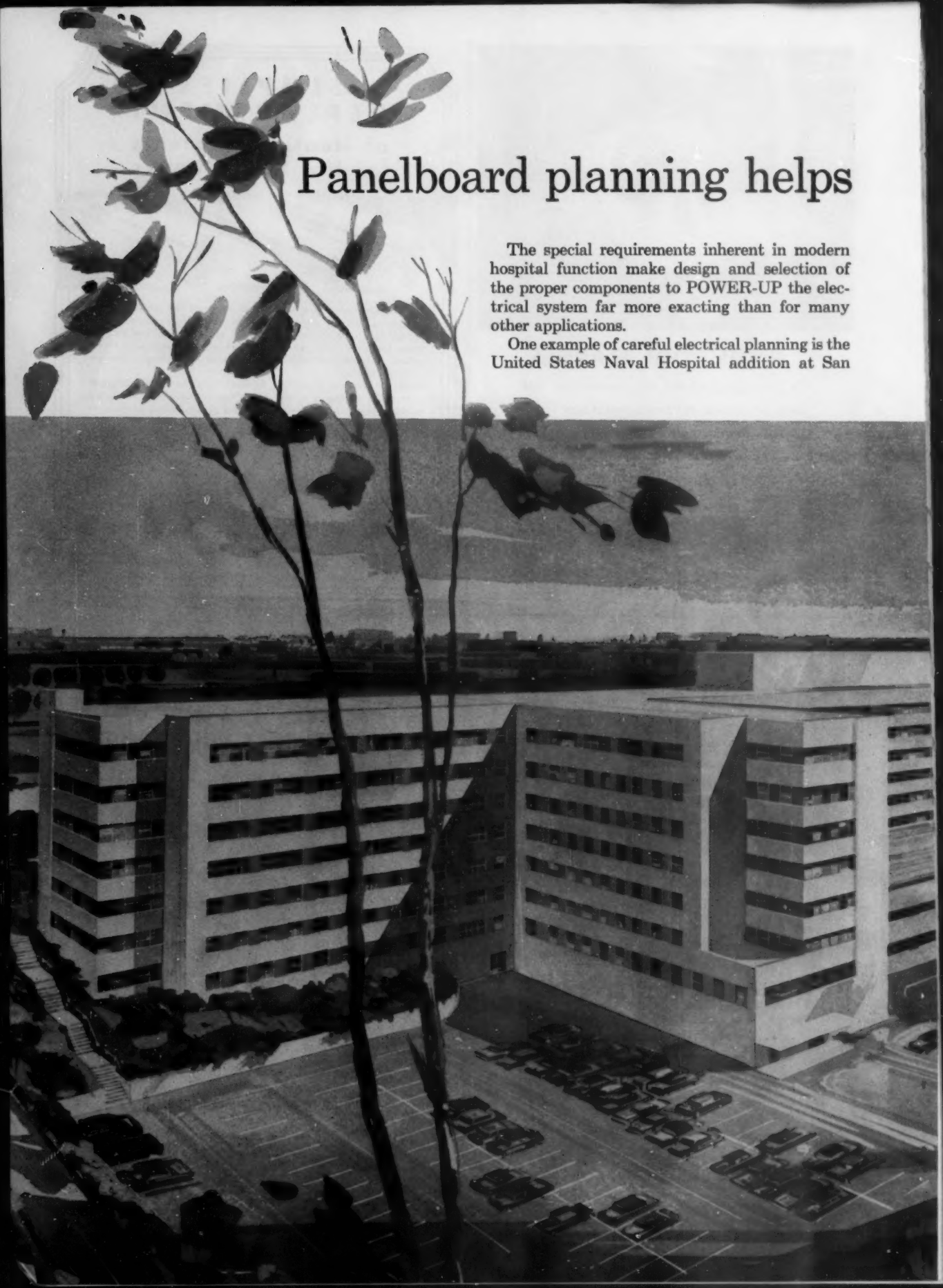
Panelboard planning helps

The special requirements inherent in modern hospital function make design and selection of the proper components to POWER-UP the electrical system far more exacting than for many other applications.

One example of careful electrical planning is the United States Naval Hospital addition at San

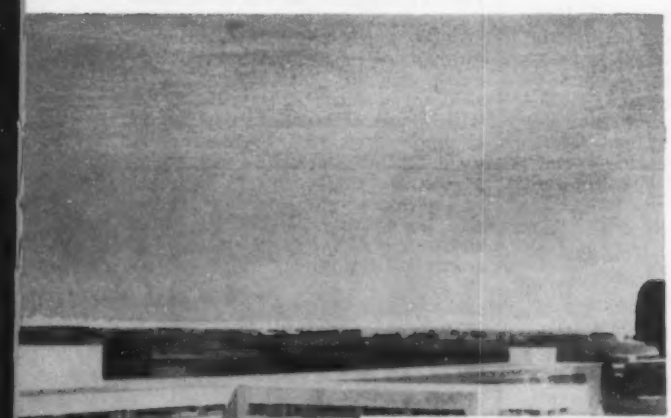


Power-up San Diego Naval Hospital

Diego, California, where Westinghouse Panelboards were specified to serve as the vital nerve centers of the hospital electrical distribution system.

In addition to several Westinghouse switchboards, a total of seven Westinghouse type CDP power distribution panelboards and 64 type NA1B lighting panelboards were installed in the new 1000-bed addition to the naval hospital.

Find out how Westinghouse Panelboards can help you POWER-UP for greater profits; contact your nearby Westinghouse office, or write: Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania. J-93544



United States Naval Hospital, San Diego, California

ARCHITECT-ENGINEERS: Welton Becket and Associates, Los Angeles, California

GENERAL CONTRACTOR: George A. Fuller, Dallas, Texas

Hospital electrician examines Westinghouse NA1B Panelboard on corridor wall. Each of these 64 panelboards controls 40 different hospital lighting circuits.

Architect-Engineers: Welton Becket and Associates

YOU CAN BE SURE...IF IT'S Westinghouse

News of the industry

edited for Southern readers

New concept of lighting is unveiled at meeting

A NEW CONCEPT of industrial and commercial lighting promotion — "Eye-Fidelity Relighting" — was unveiled, July 9th, before a meeting of leaders of all segments of the industrial and commercial lighting industry, in the Hotel Park Lane, New York. The new program, which places promotional emphasis on both quality and quantity of illumination, is sponsored by the National Lighting Bureau, NEMA, and is an expansion of that Bureau's five-year-old "Certified Lighting" program.

Chairman of the meeting was N. J. MacDonald, president, Thomas & Betts Co., vice-president of NEMA, and chairman of the NEMA Business Development Policy Committee.

The announced program included national advertising in business magazines reaching the purchasers of industrial and commercial lighting, the tagging of member company products with the "Eye-Fi Relighting" tag, and with identification as "Member, Eye-Fidelity Lighting Group," and the production of literature for local use by groups and companies promoting good lighting.

Speakers at the meeting emphasized that "Eye-Fidelity Relighting" represents an expansion of the existing program, rather than a substitute for it. Present Certified Lighting Bureaus—or new bureaus which elect to set up certification programs—may combine the original and the new program to promote "Certified Eye-Fi Relighting." The training program of the National Lighting Bureau, which has been such a success wherever presented, will continue to be offered, and may be used with or without the other portions of the program.

George J. Taylor, vice-president of the Illuminating Engineering Society, pointed out in his address that, by 1965, the present $500 million lighting market will rise to $1 billion, merely as a result of new building and of increased awareness of the value of good lighting. However, he pointed out, the new standards to be introduced by IES, early in 1959, can contribute to boosting the market to possibly $2 billion in 1965; or, he predicted, comprehensive promotion of quality and quantity, such as is envisioned for the "Eye-Fidelity Relighting" program, can raise sales to the $4 billion level.

Taylor called upon the industry to rally behind the Eye-Fidelity Relighting Program, for their obvious mutual benefit in increasing sales, as well as for the benefit of management which purchases good lighting, and of the worker who operates under good lighting.

Taylor's presentation was supplemented by John T. Fosdick, President, Fosdick Associations, the research agency which conducted the recent study of the Certified Lighting Program. The new program was developed in keeping with the findings of this study.

In addition to Laurence C. Messick, manager, National Lighting Bureau; NEMA companies; lamp manufacturing company representatives; and representatives of Edison Electric Institute, National Association of Electrical Distributors, and National Electrical Contractors Association attended these meetings.

IES elects officers and new directors

GEORGE J. TAYLOR of New York, vice president of Day-Brite Lighting, Inc., has been elected president of the Illuminating Engineering Society for a one-year term beginning October 1, 1958. Mr.

George J. Taylor

Taylor succeeds Kirk M. Reid, illuminating engineer of the General Electric Co., Cleveland. Joe B. Browder, assistant vice president in charge of sales, and sales manager, Georgia Power Co., Atlanta, will continue as IES vice president for the second year of his two-year term.

Two new directors and six regional vice presidents also were elected recently. Among the regional vice presidents, each to serve two-year terms, is J. M. Gensburger, industrial representative, New Orleans (La.) Public Service, Inc., for the South Central Region.

Southern Section AIEI sets convention date

THE 30TH ANNUAL Meeting of the Southern Section IAEI will be held in the Hotel McAllister, Miami, Florida, October 20-22, 1958. This meeting will be the most important of many years, and subjects of vital interest are scheduled for the program. A Code Panel of nationally recognized authorities on the Code, with Frank Camus and Ben Segall as moderators, will discuss the revisions and inspection problems pertaining to the Code. The latest in electrical materials and devices will be on display, and technical advisors will be in attendance to answer questions.

Southern Region NAED to meet in October

THE FIRST ANNUAL convention of the Southern Region of the National Association of Electrical Distributors will be held October 12-15, 1958, at the Edgewater Gulf Hotel, Edgewater Park (near Biloxi), Miss.

Well over 250 electrical distributor members of NAED from the South Atlantic, South Central and Southwest states—and selected top manufacturer executives in the electrical industry—are expected to turn out for this three-day meeting.

The program at this Southern Region convention will parallel that of a medium-sized convention held nationally. It will feature top speakers from the industry and will include discussions on subjects of vital interest and concern to Southern Region members and to their manufacturer guests.

Convention sessions will be held in the morning each day, with afternoons and evenings given over to informal discussions and to relaxation and other activities—including the first annual Southern Region Golf Tournament. A full ladies' program is also planned for this convention.

Admission of manufacturers and other guests to this Southern Re-

gion convention will be by invitation only, in accordance with the wishes of the members in the region. Invitations are now being mailed from NAED headquarters to those top executives in the electrical manufacturing field who, at the personal selection of members of the Southern Region, have been asked to take part in this meeting.

According to Arthur W. Hooper, executive director of NAED, this first annual Southern Region convention is an outgrowth of the desire, as expressed by the NAED members in this area, for a sectional meeting of the industry patterned after the format of the NAED national convention.

Singleton chosen president of NEMA

NEWLY ELECTED president of the National Electrical Manufacturers Association is Joseph L. Singleton, vice-president, Industries Group, Allis - Chalmers Manufacturing Company.

Joseph L. Singleton

The announcement was made by J. F. Miller, managing director of NEMA following a special meeting of the board of governors in New York July 8th. Singleton was previously a vice-president of NEMA and a member of the board of governors.

Singleton has been associated with Allis-Chalmers since 1926. In that year he entered the firm's graduate training course after receiving his mechanical engineering degree from Alabama Polytechnic Institute. In July, 1938, he was made district manager at Denver.

In November, 1942, Singleton returned to West Allis Works as assistant to the manager of the steam turbine department. In June, 1943, he became assistant manager of that department. In November, 1945, he was made manager of the General Machinery Division's district sales offices, and in June, 1947, he was elevated to vice president and director of sales for the

Contractors and maintenance men

DEPEND ON ROYAL ELECTRIC

RUBBER JACKETED CORD

No doubt about it, the trusted name in portable cord and cable is ROYAL. Wherever dependability counts, you can count on the ROYAL line of Rubber, Neoprene, and Plastic Jacketed Cords — Machine Tool Wire — Thermostat Cable — and Heavy Duty "Powr-Kord" Extensions. Take advantage of Royal Quality Products in Quality Packaging for faster, easier, surer wiring. Catalog 4-54 gives complete details. Ask your wholesaler for a copy today, or write Royal Electric Corporation, Pawtucket, R. I.

Made RIGHT . . . *to be right on the job!*

ROYAL ELECTRIC CORPORATION
an associate of
International Telephone and Telegraph Corporation
PAWTUCKET • RHODE ISLAND

ROYAL ELECTRIC AN ASSOCIATE OF I T & T

CARY CHAPMAN & CO.
Atlanta — New Orleans
Birmingham — Greensboro

SUCHMAN & COULTER, Inc.
Miami

NURO COMPANY
Houston — San Antonio — Dallas

firm's General Machinery Division.

Singleton became vice president in charge of the General Machinery Division in February, 1951. In August of the same year he was elected to the board of directors. In June, 1955 he became vice president of the Industries Group.

KENTUCKY EXPRESSWAY LIGHTING—General Electric fluoroflood fixtures mounted at 45 degree angles, thirty inches in front of warning and direction signs, have been put into use on Kentucky's North-South Expressway. The units are turned on and off by the same controls serving mercury vapor luminaires at all interchanges along the highway.

Inspiration lighting featured in promotion

AN INCREASE in lighting fixture and accessory sales is expected to result from the "Certified Inspiration Lighting" program instituted by Thomas Industries, Inc., of Louisville, Ky., according to a recent statement by Frederick Keller, president.

Mr. Keller emphasized that he believes his company's campaign for increased lighting, which points up the advantages and convenience of theatrical lighting in the home, can be the means of increasing sales of fixtures and accessories such as wire, conduit, switches and outlet boxes.

He said that through the program architects, designers, and home owners can establish the desirable number of outlets, or light sources, at the same time the floor plans are being developed. This method of planning ahead eliminates the old problem of limited outlets and insufficient lighting.

By planning in advance for sufficient outlets, the home owner will be able to have the light needed to show off to best advantage rugs, furniture, draperies, paintings, and other items in a room.

Five important lighting principles are provided by the lighting program: impression lighting for dramatic and decorative effects within the home as well as on the exterior of the home; comfort lighting for reading or working; convenience lighting for everyday family living; safety lighting to guard against bumping into objects in the dark or stumbling on stairs; and protection lighting for outdoor safety along drives, walks and entrances.

Mr. Keller further pointed out that with the lighting available through these increased sources, the home owner is able to create various moods for relaxation and entertaining as well as to show to best advantage features of the home in which he has great pride.

Rooms such as this one are the goal of the "Certified Inspiration Lighting" program being promoted by Thomas Industries, Inc., Louisville, Ky. It features the installation of extensive outlets for fixtures, permitting dramatic accent and impression lighting.

Northeast Texas Chapter of NECA elects officers

AT THE ANNUAL MEETING of the Northeast Texas Chapter of the National Electrical Contractors Association, held at the Stoneleigh Hotel on July 21, the following officers were elected, president, Robert Roy of Rob Roy Electric, Inc., vice-president, Jim L. McClure of McClure Electric Co., Inc., treasurer, Jettie Kirk of Kirk Electric Service, Inc. Directors are John D. Keys of Fischbach & Moore, Inc., Harold E. Harman of Harman Electrical Construction Co., E. B. Robison, Jr. of Hall-Fisk Electric Co., Inc., and James R. Williams of Williams & Gill, Inc. Roy P. Gay of Gay Electric Co. was named the Chapter's member on the National Association's board of governors.

In addition to the election, plans were discussed for the Association's national convention to be held in Dallas on November 16-22, 1958, when it is expected that three thousand delegates will meet in the Dallas Memorial Auditorium.

GE plans switchgear plant for Atlanta

THE GENERAL ELECTRIC Company has announced the purchase of a 40,000-sq. ft. plant in Chamblee, Ga., for the manufacture of medium voltage switchgear to serve electric utility and industrial customers in the South.

The new enterprise, launched a year ago as a small pilot operation in the G-E Apparatus Service Shop, Chamblee, will employ 70 persons in the assembly of control devices, relays, instruments and meters into switchboards for the control and protection of electrical apparatus.

Purchase of the plant, at 5134 Peachtree Road, was announced at a recent luncheon sponsored by the Industrial Development Department of the Georgia Power Company which helped with location arrangements.

Frank Hentschel, general manager of G-E's Medium Voltage Switchgear Department, Philadelphia, said the company has every reason to believe that the increase in demand for switchgear assemblies, which brought about the purchase of the Chamblee plant, will continue as Southern industry continues to grow.

He said also that the move fits in perfectly with General Electric's current "Operation Upturn" to build sales and jobs in 1958.

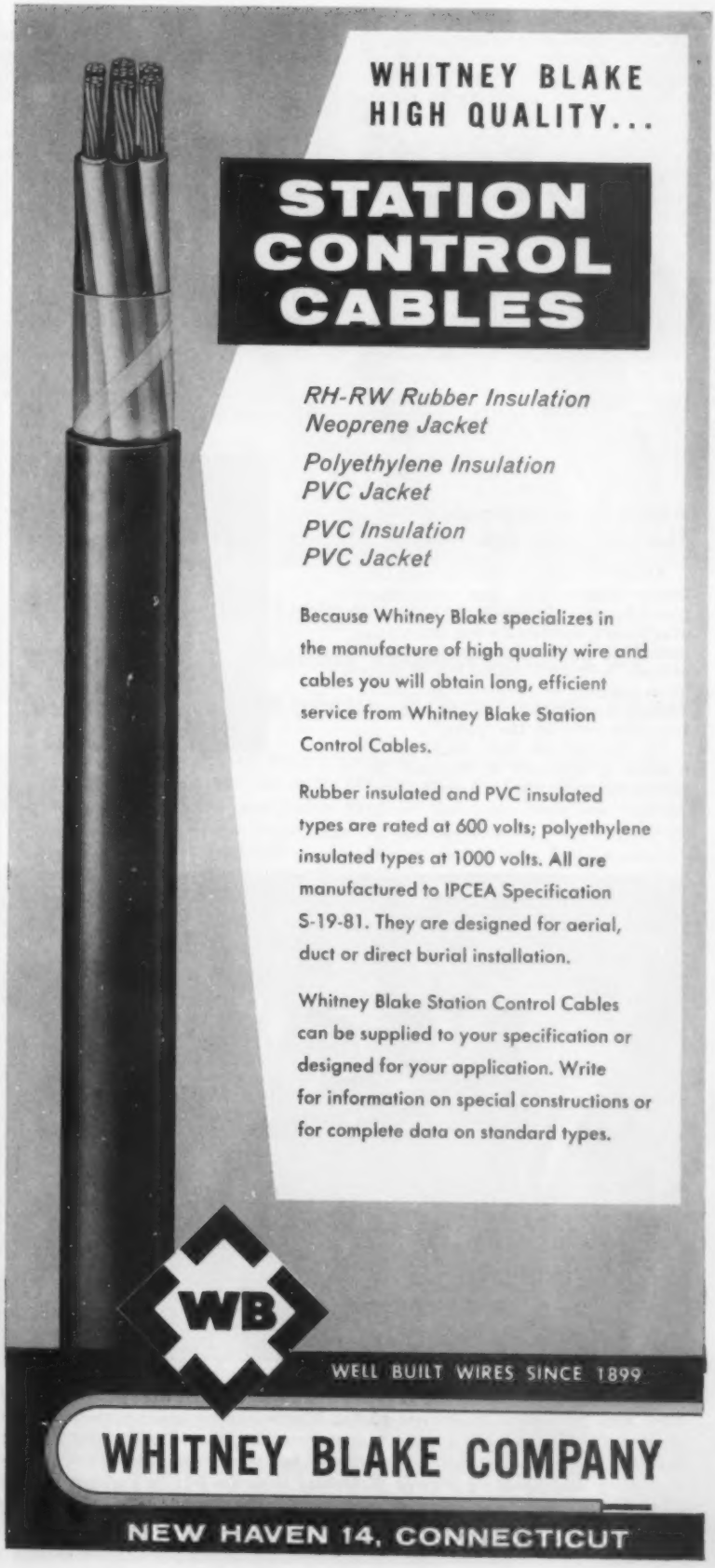
The Switchgear operation brings to more than 800 the number of G-E employees in the Atlanta area. In addition to the Apparatus Service Shop, the company maintains sales and service facilities for nearly 30 different components in Atlanta.

Since World War II, General Electric has established 24 plants in 11 Southern states to manufacture a wide variety of hard goods products. These plants represent a total investment of more than $325-million and an annual payroll of more than $150-million.

Plant expansion planned for new aluminum product

ACCORDING to a statement released by William W. Edge, vice-president in charge of the Wire and Cable Division, Copperweld Steel Company has approved an appropriation of $1,325,000 for installation of new plant facilities at Glassport, Pa., to meet the increased demand for the company's new Alumoweld wire and strand.

After several years of extensive research and development, a limit-


WHITNEY BLAKE
HIGH QUALITY...
STATION
CONTROL
CABLES
RH-RW Rubber Insulation
Neoprene Jacket
Polyethylene Insulation
PVC Jacket
PVC Insulation
PVC Jacket
Because Whitney Blake specializes in the manufacture of high quality wire and cables you will obtain long, efficient service from Whitney Blake Station Control Cables.
Rubber insulated and PVC insulated types are rated at 600 volts; polyethylene insulated types at 1000 volts. All are manufactured to IPCEA Specification S-19-81. They are designed for aerial, duct or direct burial installation.
Whitney Blake Station Control Cables can be supplied to your specification or designed for your application. Write for information on special constructions or for complete data on standard types.
WB
WELL BUILT WIRES SINCE 1899
WHITNEY BLAKE COMPANY
NEW HAVEN 14, CONNECTICUT

ed production of Alumoweld began several months ago. Alumoweld represents the successful application of a thick cladding of aluminum to steel by a weld which utilizes heat and pressure. Subsequently the bimetallic rod is drawn into wire. The new product is composed of 25% aluminum by area, and retains its firm weld and one-metal quality when drawn into wire.

A few of the advantages claimed for Alumoweld are its better corrosion resistance, better conductivity, lighter weight, and permanent high strength. It can be used for power conductors, overhead ground wires, core wires in ACSR (aluminum conductors, steel-reinforced), and for guy and messenger strand.

Anson Fyler expands Florida coverage

ANSON FYLER, of 5804 Sunset Dr., South Miami, Fla., has announced plans for the expansion of his manufacturers' agency by the establishment of two additional branch offices. A branch office has already been opened in Jacksonville, and a Tampa branch will be opened before the first of the year.

In charge of the Jacksonville branch is Richard H. Osgood, Jr., formerly with Osgood and Associates, of Atlanta. Mr. Osgood has been associated with the electrical equipment agency business since his graduation from Georgia Tech in 1952.

Among the electrical manufacturers represented by the Fyler organization are: Continental, Insul-8-Corp., Pringle, Hevi-Duty, A. B. Chance, Automatic Control, and Spring City.

I-T-E announces two new district offices

THE I-T-E Circuit Breaker Company, Philadelphia, announces the opening of two new district offices. Its new Miami district office is

H. Lee Hamilton

John W. Harrawood

located at 4216 Ponce De Leon Blvd., Coral Gables, and the other new office is in Columbia, S. C., 709 Security Federal Building. These offices will handle sales of I-T-E electrical equipment in southeastern Florida.

H. Lee Hamilton, formerly district manager of I-T-E's Washington, D. C., office will transfer to the Miami office and become its district manager.

The Columbia office replaces the Summerville, S. C., office which closed recently. John W. Harrawood, formerly of I-T-E's St. Louis office, has been appointed district manager.

WESTINGHOUSE'S FIRST ATHENS BUILT TRANSFORMER—Otis O. Rae, vice president in charge of the Westinghouse southeastern region, presents the first distribution transformer built at the company's new transformer plant at Athens, Georgia, to top officials of the Southern Company and Georgia Power Company. Shown left to right are: J. R. Carmichael, manager of purchases and stores and J. J. McDonough, president of Georgia Power; Mr. Rae; and C. B. McManus, chairman of the board, Southern Company.

Manufacturers appoint new representatives

HUGHEY AND PHILLIPS, Inc., Burbank, California, manufacturers of obstruction lifting equipment and controls announces the appointment of Frank J. Little, Jr. as east coast sales engineer. Mr. Little will be located in Washington, D. C.

* * *

TOMIC SALES and Engineering Company of Detroit, originators and manufacturers of cable, Tap-On, Twist-In, Snap-On fittings and other products, announce the appointment of W. H. Berry and Company, 201 West Worthington, Charlotte, N. C., as sales representatives for North Carolina and South Carolina.

* * *

JOSEPH E. KLEUGER, former assistant chief engineer, has been appointed regional sales manager for Texas, Louisiana, Oklahoma, Arkansas and parts of New Mexico and Kansas by Panellit Inc., Skokie, Ill. From his new headquarters in Houston, Texas Mr. Kleuger will supervise a force of 20 agents who are technically trained to sell the firm's annunciators, control panels, data loggers, and related products in the automation and control field. Mr. Kleuger holds a B.S. degree in

chemical engineering from University of Wisconsin.

* * *

Keith E. Schaefer

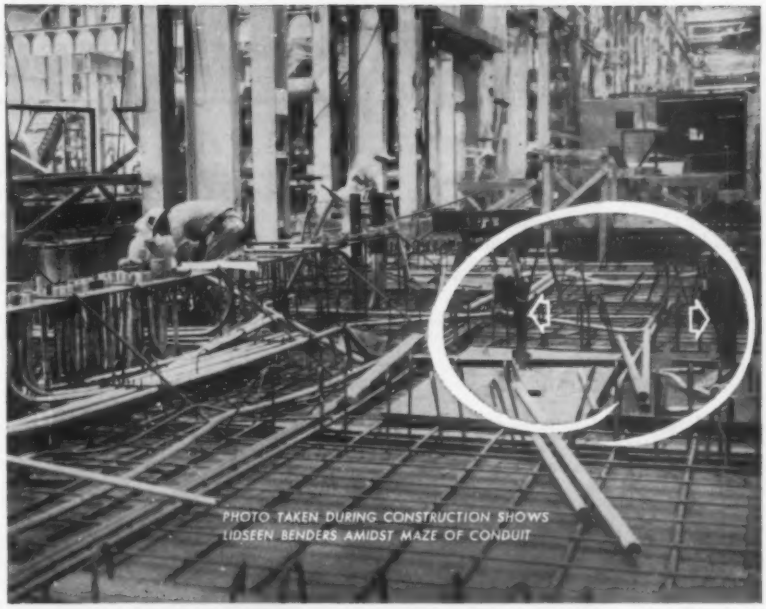
PASS & SEYMOUR, Inc., has named Keith E. Schaefer, of Houston, as sales representative for the company in the Southern Texas area.

* * *

A. D. Ray

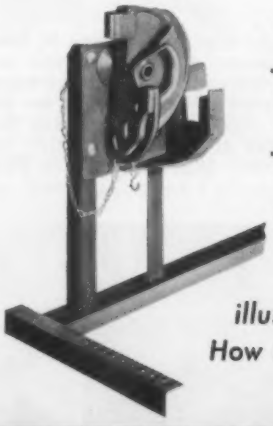
Andy Prunella

ELECTRO LIGHTING Corp., of Chicago, Ill., Reading, Pa., and Redwood City, Calif., has named two new Texas representatives to work with Traweek Healy & Associates, from offices in Houston, Dallas and Lubbock. A. D. Ray will maintain offices at 2317-B 34th St., Lubbock. Andy Prunella will headquarter at Traweek-Healy, 5523 Dyer St., Dallas.



LIDSEEN "Chicago" Benders on the job during construction of $200,000,000 Kaiser Aluminum Plant

By assisting the Foothill Electric Company, the Lidseen "Chicago" Pipe Bender played a vital role in the installation of this huge, complex electrical system of the new Kaiser Aluminum Reduction Plant and Rolling Mill. Being the largest single industrial development in West Virginia it required about 2,000,000 pounds of conduit and over 5000 precision bends. Over 30 lineal miles of aluminum conduit alone was used. The Lidseen bender is and proved to be a real on-the-job tool . . . it's rugged, has ideal working height, gives accurate bends every time . . . no strain, slipping or loose parts to worry about. Ask the electrician who is using one; he will tell you it's the finest tool available and at a price that is eminently reasonable.



BENDING CIRCLES: INSIDE RADIUS

	No. 1	No. 1T
½" conduit or pipe	2"	EMT 3"
¾" conduit or pipe	4½"	EMT 4½"
1" conduit or pipe	5¾"	EMT 6½"
	No. 2	**No. 2T**
1¼" conduit or pipe	7¼"	EMT 9½"
1½" conduit or pipe	8¾"	EMT 10½"

Illustrated: No. 1 for bending ½", ¾" and 1" rigid conduit

Write for FREE illustrated Folder on How to Bend Conduit

LIDSEEN
OF NORTH CAROLINA, INC.
1020 FIRST STREET, HAYESVILLE, NORTH CAROLINA
PHONE HAYESVILLE 2000

LEE ELECTRIC INC., of West New York, N. J., has named the D. D. Camp Co., of Atlanta as sales representatives for Alabama, Georgia and Florida.

* * *

SUPERIOR PORCELAIN CO., of Parkersburg, W. Va., has appointed the D. D. Camp Co., 230 Peters St., S. W., Atlanta, as sales agent for Georgia, Alabama and Florida.

Dates Ahead

American Institute of Electrical Engineers, Petroleum Industry Conference, Baker Hotel, Dallas, Sept. 15-17, 1958.

Public Utilities Association of the Virginias, 40th Annual Meeting Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 18-21, 1958.

Edison Electric Institute, Meter and Service Committee, Plaza and Driscoll Hotels, Corpus Christi, Texas, Sept. 22-24, 1958.

Oklahoma Utilities Assn., Light and Power Conference: Eastern District, Western Hills Lodge, Lake Sequoyah, Wagoner, Okla., Oct. 16, 1958; Western District, Lawtonian Hotel, Lawton, Okla., Oct. 17, 1958.

Southeastern Electric Exchange, Engineering and Operation Section, Hotel Roanoke, Roanoke, Va., Oct. 20-21, 1958.

International Association of Electrical Inspectors, Southern Section Thirtieth Annual Meeting, McAllister Hotel, Miami, Fla., Oct. 20-22, 1958.

Power Distribution Conference, University of Texas, Austin, Tex., Oct. 20-22, 1958.

National Association of Corrosion Engineers, South Central Region Annual Conference and Exhibition, Roosevelt Hotel, New Orleans, Oct. 20-24, 1958.

Southeastern Electric Exchange, Sales Section, Biltmore Hotel, Atlanta, Ga., Nov. 12-14, 1958.

National Electrical Contractors Association, Annual Convention, Dallas, Texas, Nov. 19-22, 1958.

Oklahoma Utilities Assn., Annual Convention, Mayo Hotel, Tulsa, Okla., March 26-27, 1959.

News about people

E. T. Cuddeback has been appointed as manager of general products division sales for the southeast region by the **Allis-Chalmers Manufacturing Co.,** Milwaukee, Wis. He will maintain his headquarters in the firm's regional office in Atlanta.

In his new position, Cuddeback is responsible for the promotion planning, and coordination of sales through the district offices, for Allis-Chalmers motors, pumps, and motor controls.

E. T. Cuddeback

A 1930 graduate of Syracuse University, where he received his B.S. in administrative engineering, he joined Allis-Chalmers in 1946 as a sales representative in the Atlanta district office. In 1948 he became manager of the Tampa district office, and has been manager of the Florida district since 1952.

Appointments of **Gillette N. Houck** as manager of promotion and technical development, **J. Carl Ferguson** as general sales manager of the Electrical Conductor Division, and **R. J. Harrison** as manager of utility sales have been announced by the **Kaiser Aluminum and Chemical Corp.**

Mr. Houck, who will have overall responsibility for directing and coordinating the division's programs, including field engineering, research and development, market planning, advertising and sales promotion, was formerly the sales manager of the Electrical Conductor Division. He joined the Kaiser Corporation in 1947, and has held a variety of sales and executive sales positions in Kansas City, Mo., Newark, N. J., and Chicago.

Succeeding Mr. Houck as Electrical Conductor Division sales manager, Mr. Ferguson will direct the activities of the division field sales force with additional responsibility for aluminum conduit sales. Previously he had served as a salesman at Kansas City, Mo., assistant product manager, and product manager at Chicago.

Mr. Harrison, as manager of utility sales, will have responsibility for coordinating sales to utility customers along with directing a key account program. He started with the company in 1950 as a salesman in Portland, Ore., and was later assigned to Chicago as manager of sales to REA cooperatives.

John A. Eitel has been appointed to the position of national advertising manager for **Pittsburgh Standard Conduit Co.,** producers of rigid steel conduit, electrical metallic tubing and related fittings.

Mr. Eitel will also retain his former duties as Pittsburgh District sales manager, the capacity in which he joined the company in 1954. He is a graduate of the University of Pittsburgh.

V. R. Young, Gulf Coast manager of the **Graybar Electric Co., Inc.,** announces the appointment of **A. N. Saxon** as branch manager at Jackson, Miss., and **E. P. Kempen** as branch

J. Carl Ferguson | Gillette N. Houck | R. J. Harrison

manager at Corpus Christi, Tex.

Mr. Saxon has been associated with Graybar since 1927. He has held positions as assistant specialist, salesman, manager of lamps and lighting, and branch manager.

Mr. Kempen began his career with the company as a student engineer in 1948, subsequently serving as office salesman, assistant power apparatus specialist, salesman, and power apparatus sales manager.

Allis - Chalmers Manufacturing Company has named **William Morrison** as a sales representative in the district offices at Charlotte, N. C. An

William Morrison

industrial management graduate of Georgia Tech, Mr. Morrison recently completed Allis-Chalmers general purpose equipment training course.

Southern States Equipment Corp., of Hampton, Ga., recently announced the appointment of **H. C. Anderson, Jr.,** to the post of assistant sales manager. Prior to assuming this new posi-

H. C. Anderson, Jr.

tion, Mr. Anderson was located in Portland, Oregon as Western District Manager. He has been associated for the past twelve years in all phases of the company's operations.

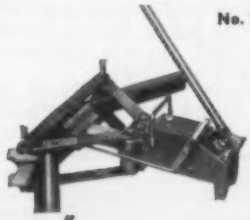
The appointment of **Louis P. Robinson** as sales supervisor in the Atlanta District for **Sylvania Lighting**

GREENLEE

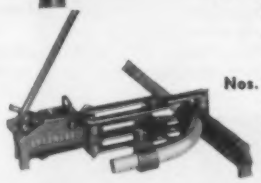
LIGHTWEIGHT HYDRAULIC CONDUIT BENDERS

No. 884 Hydraulic Power Bender for conduit sizes ½" - 4". For faster, easier 90° bending of conduit in ten sizes up to 4" . . . *makes full 90° bend with one ram stroke.* Operated with the GREENLEE No. 798 Power Pump as shown here, the GREENLEE No. 884 Power Bender bends 4" conduit or pipe 90° in just four minutes . . . makes same bend in only thirty seconds with No. 797 Power Pump. Develops 40 tons ram pressure — yet high-strength aluminum and steel construction reduces weight to minimum. Easily wheeled from job to job on pipe supports specially designed to serve as rollers. Operates in any position. Conduit is inserted and removed from front . . . one pair of universal pipe supports rotates to handle all pipe sizes . . . a dozen special features place this new bender in a class by itself for versatility, speed, and ease of setup and operation by one man.

No. 880 Lightweight Hydraulic Bender for conduit sizes ½" - 2". Makes full 90° bend with one ram stroke . . . assures uniformity of bends in pipe and conduit of ½" through 2" sizes. One man easily carries and operates the GREENLEE No. 880 Hydraulic Bender . . . simplified quick setup. Ram fits GREENLEE thin-wall conduit, tubing, and bus-bar bending attachments. Designed for easy hand-pump operation, the No. 880 also teams with a GREENLEE power pump for production jobs.



No. 770 Hydraulic Bender for conduit sizes 1¼" - 3". Maximum piston pressure of 25 tons for fast, easy bending. One-man operation. Easily operated by hand or a power pump, the No. 770 Bender makes fast, smooth bends without the use of heat or filler. Extra attachments available for bending ½", ¾", and 1" sizes.



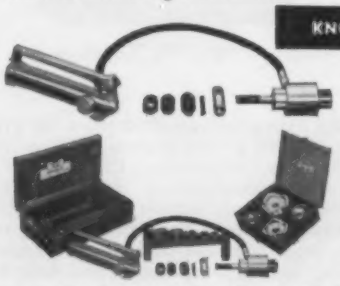
No. 775 Hydraulic Bender for conduit sizes up to 5". Similar to the No. 770 Bender, but is designed to bend larger size conduit and has a maximum pressure of 40 tons. Will easily make smooth, precise bends in cold conduit and pipe. Either hand- or power-pump-operated. Shoes and supports available for this machine make it possible to bend eight sizes of pipe from 1¼" to 5".

Nos. 770-T and 775-T Thin-Wall Hydraulic Conduit Benders. GREENLEE No. 770 or 775 Power Unit with attachments to make a full 90° bend with one ram stroke and prevent crushing and kinking of thin-wall material. The attachments bend ¾" - 2" thin-wall conduit . . . easily and quickly applied to the No. 770 or 775 Power Unit.

Nos. 770-BB and 775-BB Hydraulic Bus-Bar Benders. For making accurate bus-bar bends in a wide range of sizes. Consists of the No. 770 or 775 Power Unit fitted with a GREENLEE bus-bar bending attachment. Regular "U" bends, 90° bends, or offsets are easily made in any size bar up to 6" wide and 1" thick.

No. 785-BE Power Bender. A powerful portable bender for heavier bending. Develops 100 tons of ram pressure to bend rigid conduit or standard pipe in 1¼" to 6" diameters, and is rugged enough to bend 5" extra-heavy or double-extra-heavy material with ease. 20" stroke permits 90° bends in one setting. Can be driven by either an electric or gasoline motor.

KNOCKOUT PUNCH DRIVERS AND PUNCHES



Make smooth holes for conduit *in seconds* with a GREENLEE Hydraulic Knockout Punch Driver and GREENLEE Knockout Punches. Use driver with all size punches for conduit ½" through 5". Driver available separately (No. 7646A), or in handy sets with ten punches for ½" to 4" conduit (No. 7310), or with six punches for ½" to 2" conduit (No. 7306). Also separate set of four punches for 2½", 3", 3½", 4" conduit (No. 7304). Knockout Punch No. 743 is available for 5" conduit.

GREENLEE TOOL CO., 1789 COLUMBIA AVE., ROCKFORD, ILLINOIS

Products, a division of Sylvania Electric Products, Inc., has been announced by **Garlan Morse,** divisional vice-president, sales.

Mr. Robinson joined Sylvania in 1949 as a sales representative covering the Alabama and Northwest Florida territory. Prior to his association with Sylvania, he held sales posts with the Colgate Palmolive Peet Co., the Pet Milk Co., and the Parker Pen Co.

Federal Pacific Electric Company has promoted four regional sales executives in the South and Southwest, according to an announcement by **Robert L. Bobo,** general sales manager.

Those advanced were **W. L. Sullivan,** former Southwestern district manager, to Southeast regional manager; **Glenn Ellis,** previously Dallas branch manager, to Dallas district manager; **Ted Beyert,** former Houston branch manager, to Houston district manager; and **Felix W. Truss, Jr.,** previously a field engineer with the company's Oklahoma City sales office, to Kansas City district manager.

W. L. Sullivan

Glenn Ellis

Mr. Sullivan, the new Southeast regional manager, will direct company sales activities in the states of Georgia, Alabama, South Carolina, Florida, and parts of Kentucky, Tennessee, Virginia, Louisiana, Mississippi and North Carolina from headquarters at 5745 Peachtree Industrial Blvd., Atlanta.

A native of Dallas, Texas, Mr. Sullivan has spent his entire professional career with Federal Pacific. He joined the company in 1946 and before becoming Texas and Oklahoma district manager, worked as a Federal Pacific sales engineer in the Oklahoma and north and east Texas area.

Glenn Ellis, new Dallas district manager, was employed by the Texas Electric Service Company and General Electric before joining Federal Pacific in 1952. He is a graduate of Texas A and M College.

Ted Beyert, who now heads the Houston district, joined Federal Pacific in 1948 after his graduation from Washington University in St. Louis. In 1952 he was made field engineer at the company's San Antonio office, and a year later, Houston branch manager.

Felix W. Truss, Jr., new Kansas City district manager, has been with the company since 1952 when he was appointed a field engineer at Federal Pacific's Oklahoma City branch.

Ted Beyert

Felix W. Truss

An announcement by James D. Hicks general superintendent of the **Tampa Electric Co.,** reveals the promotions of **Lester Ulm, Jr.,** to general engineer of the company, and **Alex B. Hull, Jr.,** who becomes head of the Distribution Engineering Department, succeeding Mr. Ulm.

A 1949 graduate of Georgia Tech, where he majored in electrical engineering, Mr. Ulm has been a Tampa Electric engineering employee since May, 1950.

Mr. Hull began his career with Tampa Electric in 1946, and left in 1952 to return to college. He completed requirements for an electrical engineering degree at the University of Florida in 1955.

Announcement was made recently by William E. Hopper, Sr., of **Hopper & McCoy,** electrical manufacturers agents, of the appointment of **Daniel B. Wray** to the company's Atlanta sales staff.

Daniel B. Wray

Mr. Wray has been associated with the electrical industry since 1937 and has held positions with Westinghouse Electric Supply Co., Mills-Lupton of Chattanooga, and Electrical Wholesalers of Atlanta.

S. T. Walz, southeastern manager for the **Square D Company,** has announced the appointment of **H. L. Prescott** as manager of the company's Greenville, S. C., branch office. Mr. Prescott has been serving as field engineer at Charlotte, N. C., since 1956. He joined Square D in 1954 following his graduation from Georgia Tech.

H. L. Prescott

Technical books

Code changes

"Proposed Amendments of the 1956 National Electrical Code," NFPA No. 70 National Fire Protection Association, Boston 1958 140 pages, 3¾" x 7¼", $1.75.

Important revisions proposed for the National Electrical Code in its 1959 edition have just been released by the National Fire Protection Association.

Panel reports, coordinated through the Correlating Committee of the NFPA Electrical Code Committee, are now available for study and comment by the electrical industry.

One of the most significant proposals is to make effective the requirement for installation of fuseholders of the Type S design, for use with fuses of 30 amperes or less. This would delete the suspension of Section 2452 now in force.

The effective date for the required installation of fuseholders of the Type S design would be set for January 1, 1961.

A proposed change of language in the code section dealing with receptacle outlets in residences—Section 2124.b.—is also of widespread interest. Now calling for an outlet every 12 linear feet, the section would be revised to require that outlets be installed so that no point along the floor line in any usable wall space is more than six feet, measured horizontally, from an outlet.

Another revision affecting residence installations deals with branch circuits required. Section 2115.b. would be changed to require a minimum of two 20 ampere receptacle branch circuits for the small appliance load in kitchen, laundry, pantry, dining-room, and breakfast-room. The present requirement is for one such circuit.

Industry comment and recommendations should be made to the chairman of the Code Committee.

Math history

"History of Mathematics," by D. E. Smith. Published by Dover Publications, Inc., 920 Broadway, New York 10, N. Y. Two Volumes, $5.00.

"History of Mathematics" is divided in two major sections. The first volume is chronologically arranged by man and country. The second volume is arranged by subject, discussing the evolution of the different divisions of mathematics. The two-volume set can be bought boxed for $5.00, or individually at $2.75 per volume.

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for any requirement
SELLS MORE JOBS!

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HEAT BETTER ELECTRICALLY!

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Cavalier's new Baseboard gives you more advantages than ever! Heating element is **fully enclosed** in tubular steel sheath . . . same type proved so reliable and long-lived on electric ranges. No shocks, no burns. Maximum surface temperature never exceeds 125° F. — **Cavalier exclusive feature** — yet heating output is full 200 watts per lineal foot.
Saves time and materials. Fewer sections required; jobs finished faster. Special duplex 115V convenience outlet sections and thermostatic control section build in. Saves labor and run of wire across room to wall thermostat. No carpentry. No moving parts, nothing to wear out or cause trouble. No profit-robbing callbacks!

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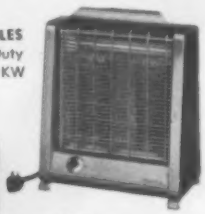
BASEBOARD
32", 48" heating sections,
special thermostat and outlet sections

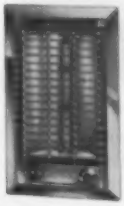
WALL INSERTS
1.5, 2, 2.5,
3, 4, 5 KW

HEATING CABLE

PORTABLES
Heavy-Duty
2, 3, 4 KW



FLOOR FURNACES
5, 8 KW



BATHROOM
Automatics: 1.25, 1.5 KW (115/120V), 1.5 KW (230/240V). Non-automatic: 1.25 KW (115/120V).

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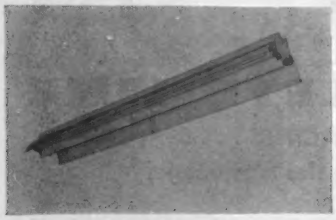
Over 90 Years of Quality Products

New products

Factory lighting units are designed for long service

DESIGNED for top value lighting and long-term use in modern factories, a new series of industrial lighting units, the Monitor, has been announced by Smithcraft Lighting of Chelsea 50, Mass. All Monitor units feature low installation and maintenance costs. They may be quickly and economically mounted, individually or



in continuous rows, by any conventional method. The housing is a flanged channel with integral rails for added leaks and align reflectors perfectly in continuous rows. For quick and simple maintenance, reflectors release easily by means of easy-to-grasp, yet unobtrusive catches. The turret lampholders of the Monitor provide trouble-free service and securely lock lamps in place.

The Smithcraft Monitor and Monitor V-25 units use rapid-start, slimline, and high output lamps. Monitor V-25 directs about 25% of the fixture output upwards through scientifically designed collared apertures; the Monitor provides approximately 15% uplighting in 2-light fixtures, and 12% in 3-light fixtures. The units may be purchased with louvers for crosswise and lengthwise shielding—20 x 30 degrees for Monitor, and 30 x 30 degrees for Monitor V-25.

For additional data, ask for item P-914, using the coupon on page 121.

Flexible steel conduit connector now in two sizes

A COMPANION-PIECE to the ½" flexible steel conduit connector, No. 302, which is a ¾" connector, has been introduced to the market by Tomic Sales and Engineering Co., of Detroit, Mich., originators of many well-known fittings.

The installation of this latest conduit connector is very simple; no tools are necessary, all that is required is to twist it in. Other features include positive ground, smooth interior and rounded throat, all steel construction, and the fact that it will not shake loose.

For additional data, ask for item P-915, using the coupon on page 121.

Manufacturer redesigns tape dispenser cans

TEN-ROLL shop dispenser cans of Plymouth electrical tapes have been re-designed, and will so appear on

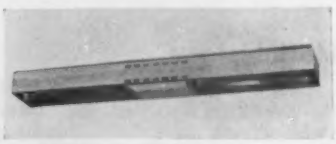
distributors' shelves in the near future, according to a recent announcement by Plymouth Rubber Co., Inc., Canton, Mass.

The dispensers now match the Slipknot family of individual-roll cartons. Can for 10 rolls of Slipknot black friction tape is now in the familiar orange and blue; the splicing compound can is black and deep red; and the new 10-roll dispenser for Slipknot brown friction tape matches the recently revamped individual carton, in deep brown and yellow. All are printed on high-grade, lacquered stock for greater durability and recognition.

For additional data, ask for item P-916, using the coupon on page 121.

Radiant heat and light unit adapted for bathroom heating

An all-radiant heat and light unit that solves the problems of bathroom heating is now available from Ampere Industries, 60 Boston Street,



Newark 3, N. J. The unit, which is also adapted for nursery, playroom and kitchen use, provides soft lighting and radiant heat.

With the Ampere All-Radiant Heat-N-Lite there are no fans, no drafts and no hot spots.

Ampere Industries also features all-radiant baseboard units, ceiling panels, and portable units.

For additional data, ask for item P-917, using the coupon on page 121.

Model RP 125
Roof Plate and Flashing

new M&W one-piece fitting

★ *speeds installation, saves costs, combines two separate fittings in one*

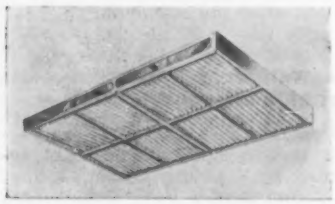
You'll make service entrance jobs easier, faster, better with this field-proved two-in-one fitting. It combines roof plate and flashing in a single aluminum casting. Takes only minutes to install: just lag-screw to roof and seal with weather-tight compound around mast. It's extra-strong, too—tests prove less lever action on the mast, greater strain resistance. Available in 1¼, 1½, 2 or 2½" sizes—separately or in a complete selection of M&W Mast Kits.

NEW CATALOG 57 gives full details, prices on complete line electrical fittings. Send for your copy today.

M&W Electrical Fittings
The M. & W. ELECTRIC MFG. CO., Inc.
EAST PALESTINE, OHIO

Illuminated fixture sides reduce contrast with ceiling

LEADLIGHT Fixture Co., 800—100th Ave., Oakland, Calif., announces the addition of the SDHI series to its fluorescent lighting fixture line. Surface mounted, using Holophane Prismalume® 6025 Controlens® with illuminated sides of cream white



ribbed polystyrene, the series is exactly 24" wide in order to conform to ceiling tile lines.

The illuminated sides serve to illuminate the ceiling adjacent to the fixture in order to eliminate contrast of dark ceiling to illuminated fixture.

The Holophane 6025 Controlens® are enclosed in 24" by 48" hinged frames, which can be lifted out for convenience in maintenance. Lamp spacings and optical train conform to Holophane Company recommendations.

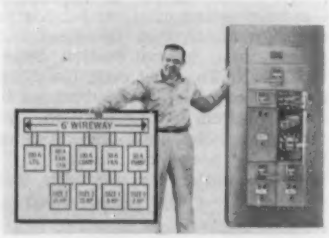
Leadlight Fixture Company advises that the use of Holophane 6025 Low Brightness Controlens® makes it possible to achieve up to 250 footcandles in illumination without annoying brightness.

For additional data, ask for item P-918, using the coupon on page 121.

Installation time and space conserved by panelboards

INSTALLING magnetic starters in panelboards instead of mounting starters and disconnect switches separately reduces installation time and space requirement according to reports from the manufacturer, Square D Co., 6060 Rivard St., Detroit, Mich.

QMB panelboards accommodate reversing and non-reversing starters,



sizes 0-3. Switchboards and unit substations handle sizes 0-5. All are available, factory - assembled and wired, but separate enclosures, starters, and plug-in switch units are available from distributors.

For additional data, ask for item P-919, using the coupon on page 121.

"IT IS TOO BETTER"

The direction a photoelectric lighting control faces and what light it sees makes a world of difference in how well—*and how long*—it operates. The *color* of the light seen by the control has pronounced effects on its behavior. At sunset the red portion of daylight is notoriously erratic in its decline, dropping rapidly one minute and sometimes increasing again the next, depending on clouds, dust particles in the air and other unpredictable elements. The *blue* portion, on the other hand, decreases quite smoothly and uniformly day after day. The best source by far of this blue light is the north sky. Also direct sunlight will ruin the photosensitive device of any control in almost no time. Consequently, some way to keep sunlight off the tube or cell has to be found.

Like anyone else building photoelectric controls, we are well aware of these facts and we cater to these light differences by designing F-P controls for *directional* operation. The direct sunlight problem might be solved partly by putting a translucent enclosure around the whole control, but that invites new troubles because the control then has to work that much harder on a lot less light. Even a translucent shield will not give enough protection if the sensitive element within is directly in line with sunlight. Facing an F-P control in the general direction of "north" (give or take 30 degrees) more than pays for itself in longer operating life, less trouble and more dependable turn-on. There are also times when you're glad you *can* orient a control: in city locations where a control has to sit next to marquee lights or electric signs, facing it a few degrees away from the lights can often be a life-saver.

This is why our controls are meant to operate facing only one way instead of any old way. Probably the best proof that the idea is a good one is the service F-P controls have given our customers in the last 12 years. Taking advantage of north light has paid off for them—and can for you.

The Fisher-Pierce Co., 59 Pearl Street, So. Braintree 85, Massachusetts.

FP

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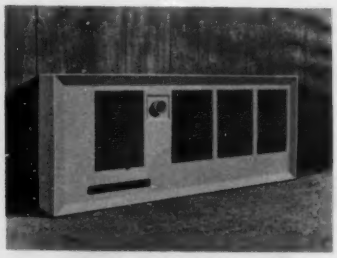
PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

Heater combines baseboard and forced air features

FORCED AIR ELECTRIC baseboard heat is being introduced to home builders for the first time. The combination baseboard and forced air heater is manufactured by Hunter Division of Robbins and Myers, Inc., 2500 Frisco Ave., Memphis 14, Tenn.



A low-speed centrifugal fan recovers floor level air before it becomes cold and delivers freshly heated air directly into the "living zone"—not up the wall. The fan operates in tandem with thermostat-controlled heating elements.

Installation is simple in new or existing structures for the heater comes in a single package and has no accessories to assemble. A safety feature is the automatic disconnection of electricity when the front grille is removed for cleaning.

Models are available in 1,000, 1,500 and 2,000 watts; Btuh range from 3,400 to 6,810. The heater measures 33″ x 13″ x 3-7/8″.

For additional data, ask for item P-920, using the coupon on page 121.

Dry-type transformer has advanced design features

PROGRESS in the manufacture of a sealed dry-type transformer by I-T-E Circuit Breaker Co., Switchgear Division, 19th and Hamilton, Philadelphia 30, Pa., now enables them to provide all major components—switchgear and transformers—for its line of unit substations. Only liquid-filled and ventilated dry-type transformers were made by the company in the past.

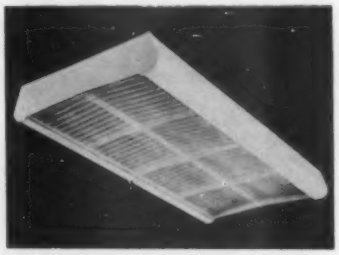
Incorporating advanced design features, such as solid copper secondaries, which provide strength to meet electrical and mechanical stresses produced by short circuits and overload conditions, and a new system for clamping coils to core assemblers, produces a rugged, long-life unit.

In addition, the manufacture of this dry-type transformer is expected to shorten lead time on delivery and simplify servicing. Service and maintenance requirements are reduced to a maximum by this unit because the sealed type unit, enclosed in a shell filled with an inert gas, requires no attention after installation. Class H insulation maintains protection at the higher operating temperatures which prevail within a sealed enclosure.

For additional data, ask for item P-921, using the coupon on page 121.

Contemporary fixture has high efficiency

CREATING a striking effect in Hector, another fixture series just revealed by Lighting Dynamics, Inc., 8700 Ambassador Row, Dallas, Tex., is the contrast of the Prismalume lens against smooth, curved lines. The new fixture was designed specially for the Holophane Prismalume lens, noted for its brightness control and efficiency. The engineering of the Hector series provided side panels which produce low contrast with the ceiling and lens; this affords maxmum comfort.



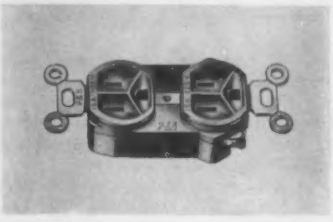
Its creators feel that the Hector's striking contemporary style, combined with its light control and comfort qualities will make it applicable in a variety of areas, ranging from prestige rooms such as executive offices to areas with critical seeing tasks.

For additional data, ask for item P-922, using the coupon on page 121.

Three-wire grounding outlet has pressure terminals

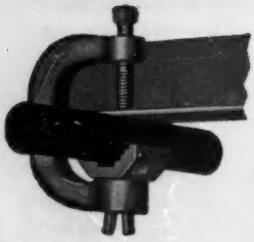
A THREE-WIRE grounding outlet with pressure terminals has been added to the extensive line of electrical wiring devices manufactured by Pass and Seymour, Inc., Solway Station, Syracuse 9, N. Y. The new unit, No. 5232, embodying all the latest advances in such an outlet, is designed for industrial and business installations and also for home use.

The 5232 outlet, for use with #12



Latrobe PRODUCTS

FLOOR BOXES • WIRING SPECIALTIES



PIPE OR CONDUIT HANGER

Safe and convenient for hanging ½", ¾", and 1" pipe or conduit to steel beams up to ⅜" thick. Larger hangers for larger pipe.

INSULATOR SUPPORTS

Insulator Supports are safe and sure for fastening glass or porcelain insulators to exposed woodwork. 4 sizes, from 1" to 2½".

PRODUCTS

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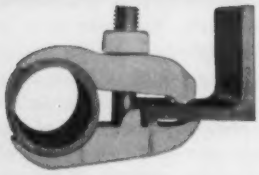
Pipe or Conduit Hangers
Gang Boxes • Junction Boxes
Nozzles • Fish Wire
Cable Supports
Insulator Supports
Staples and Cable Clips



"LATROBE" PIPE OR CONDUIT CLAMP

This clamp is made of highest quality malleable iron, with a double safety bite of case hardened tool steel and is cadmium plated to prevent rust. Two models—one for Right Angle and the other for Parallel support. Each model comes in 10 sizes to handle pipe or conduit ½" thru 4".

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F. P. WALTER COMPANY
4030 Chouteau Ave., St. Louis 10, Mo.

JIM ROBERTSON & COMPANY
2104 Irving Blvd., Dallas, Texas
1901 Commerce St., Houston, Texas

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

and #14 solid wire, has high quality bronze springs that hold wires securely and prevent loosening from vibration. Bronze contacts with rounded surfaces assure trouble-free insertion and withdrawal of cap blades. These double-grip contacts are fully enclosed in individual pockets. Built-in slots position wires within outlet body.

A wide release slot in the P and S outlet permits loop wiring to save time and simplify wiring. The unit also has a recessed gage to indicate length of wire to be stripped, and the terminals are clearly identified for black and white wire.

For additional data, ask for item P-923, using the coupon on page 121.

Versatile floodlight has dial for beam spread selection

GREAT INTEREST has been shown in a versatile floodlight by Appleton Electric Co., 1701 Wellington Ave., Chicago 13, Illinois. The new series

6050 is an easy-to-mount, rugged, all-aluminum floodlight designed for lighting problem areas which are dark and unsymmetrical, such as shipyards, storage depots and warehouses. Special attention was given to an adjustable dial mechanism for wide range focus in any direction, allowing greater selection of beam spreads.

Lamp changing is accomplished quickly because of a free-swinging cast aluminum cover ring, which also offers simplicity and ease of servicing. The new floodlight has a heat resistant lens, weather-tight construction, waterproof cord gland for lead-in wiring, and can be used with Mogul base 300 or 500-watt incandescent lamps or mercury vapor lamps.

For additional data, ask for item P-924, using the coupon on page 121.

Junction conduit fittings for indoor and outdoor use

PRODUCTION of a new line of watertight and weather resistant junction Condulets, Series WJB, suitable for both indoor and outdoor use has recently been begun by Crouse-Hinds Co., Syracuse 1, N. Y. Even when the area is washed down with a hose, electrical wiring inside the Condulet

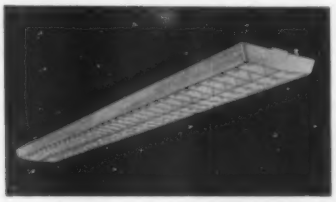
is protected by a round neoprene gasket, which prevents water from entering. The body is of outside flange design, with four cast mounting feet.

Three sizes are available: 4", 6", and 8" in width. Walls can be drilled and tapped for conduit up to 2", and brazed hubs can be added for larger sizes.

For additional data, ask for item P-925, using the coupon on page 121.

Extra-slender fixture has economy, upkeep ease

AN EXTRA-SLENDER, economical fluorescent commercial design with one-piece extruded plastic side-panels is a recent addition to the line of Peer-



less Electric Co., 576 Folsom St., San Francisco, Calif. The shielding for the fixture, named the Vanguard, is accomplished with a 35 x 35 degree baffle-louver of 20-gauge steel for permanent straight-line rigidity. This louver drops on retaining chains for relamping and service. The ends, channel, and all metal parts are finished in baked white, high-reflectance enamel. The matte-finish, one-piece plastic panels are impact resistant, destaticized, and stable against shrinkage, warping, and discoloration.

The fixture may be mounted in various ways: from the ceiling, suspended from stems individually, or in continuous runs. It is available in two lamp 48" rapid start or slimline; also available are two or four lamp 72" slimline and two or four lamp 96" slimline.

For additional data, ask for item P-926, using the coupon on page 121.

Epoxy resin cast employed in encapsulated motor

MAKING A STRONG bid for use in situations once considered the prime area for enclosed motors is the recently announced encapsulated motor by Allis-Chalmers Manufacturing Co.,

What is a FAIR PRICE?

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suggests fair resale prices for electrical materials and tells you what they cost from day to day.

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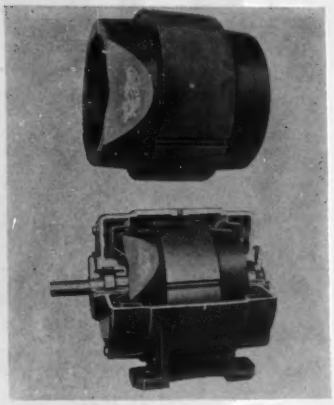
938 S. 70th St., Milwaukee 1, Wis. By completely casting open-type motors in an epoxy resin, Allis-Chalmers has produced an addition to its Super-Seal line that features complete protection for the insulation system.



Encapsulated insulation systems can be used where heavy moisture or contaminated atmospheres could destroy the effectiveness of conventional insulation systems previously protected by special enclosures. Such applications include those involving the most severe conditions of outdoor service: cooling towers and fertilizer plant processing lines, for instance. The epoxy system can be used at a considerable savings in initial motor investment.

In this process, the winding end turns are completely enclosed in a hard, protective case, making them impervious to moisture and resistant to attack by solvents, oils, and the most commonly encountered chemicals. The slot portions are also given the same protection.

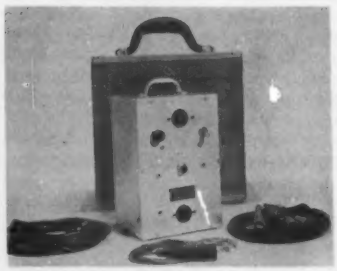
Super-Seal epoxy resin encapsulation will soon be available in all integral horsepower frame sizes in which random-wound coils are used.

For additional data, ask for item P-927, using the coupon on page 121.

Device identifies, separates unidentified conductors

RAPID AND CERTAIN identification of up to 4 unidentified conductors simultaneously is afforded by a new instrument recently announced by the J. W. Dice Co., 16 Highwood Ave., Englewood, N. J.

A code signalling transmitter, attached to one end of the unidentified conductors with a common lead attached to the ground, sends out repetitive identified coded signals on each of the conductors. An operator then attaches a code receiving device at the distant ends of the conductors, obtaining instant identification.



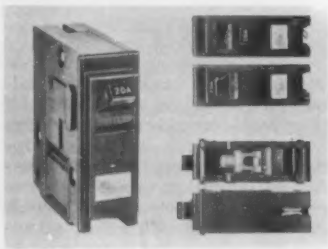
Safety to personnel is insured by low test voltage. Including carrying case and 20 ft. cables, the weight of the device is 15 lbs.

For additional data, ask for item P-928, using the coupon on page 121.

Unique plug-in circuit breaker priced competitively

A COMPETITIVELY priced, plug-in type, fully magnetic circuit breaker with all of the performance characteristics of its original magnetic breaker has been announced by Murray Manufacturing Corp., 1250 Atlantic Ave., Brooklyn, N. Y.

An outstanding feature of the new breaker, which will be known as the "MP", is its unique plug-in design which allows it to fit in load centers without wobble. The breaker can be plugged in quickly with one hand. Metal jaws on one end which grasp bus bar are recessed to prevent damage.



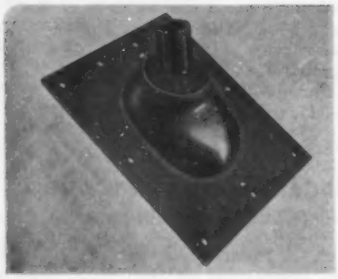
Like its prototype, the "MP" is fully magnetic and unaffected by surrounding temperatures. It offers complete protection at all degrees of overload, never needs derating. There are only two switch positions: "on" and "off." The breaker can be reset immediately after tripping.

A complete line of "MP" load centers with from 2 to 42 circuits has been designed to carry new breaker.

For additional data, ask for item P-929, using the coupon on page 121.

Cast aluminum fitting stands greater load pull

PULL TESTS SHOW that a one-piece aluminum fitting which combines two conventional fittings for entrance masts—roof plate and flashing—will withstand load pull exceeding the conduit bending point. The cast fit-



ting, Type RP aluminum roof plate and flashing, is manufactured by the M and W Electric Manufacturing Co., Inc., East Palestine, Ohio.

The cast fitting has several practical advantages: weather resistance, light weight, and rigid mast support. Type RP fittings are furnished with Duxseal or neoprene hood for watertight entrance closure. Eight sheet metal screws are supplied for attachment to standard sheeting. Sizes are available for 1¼", 1½", 2" or 2½" entrance masts.

For additional data, ask for item P-930, using the coupon on page 121.

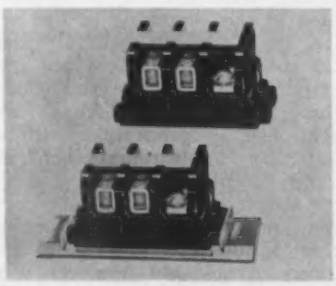
Medium-duty sectional block speeds-up assembly at job

A MEDIUM-DUTY sectional block which may be assembled on the job without fastening hardware—or factory pre-assembled to required specifications—has been introduced by the Buchanan Electrical Products Corp., Hillside, N. J. Block speeds on-the-job assembly to any number of circuits, with choice of contacts and mounting methods.

Block can be anchored at any desired location without loss of space or disruption of circuit spacing continuity, and can be extended in length without removing any mounting screws. All contacts feature electrolytic copper, heavy plating, positive wire stops and secure attachment to moldings. Contacts are 7/16" centers.

Tubular contacts for stripped wires or combinations of two or more wires are available with screw contact for #18 through #8, or clamp contact for #22 through #10 wire. Strap screw contacts for terminal-ended or looped wires accommodate any 5/16" or narrower ring or spade terminal for #7 or larger stud.

For additional data, ask for item P-931, using the coupon on page 121.



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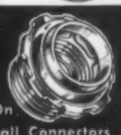

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Free bulletins

available to our readers

Special tables designed to facilitate selection of **electric motor controls** are included in a fifty-six-page catalog on that subject available from **Furnas Electric Co.,** 1064 McKee St., Batavia, Ill.

For additional data, ask for item B-932, using the coupon on page 121.

A new line of **mechanically-held latched-in relays** which need no extra vertical height is described in a bulletin available from the **Clark Controller Co.,** 1146 E. 152nd St., Cleveland 10, Ohio.

For additional data, ask for item B-933, using the cupon on page 121.

A 20-page reference work on d-c **crane controls** has been published by the **Clark Controller Co.,** Cleveland 2, Ohio. In addition to being a complete catalog of Clark d-c crane control equipment, the bulletin is a manual on the selection and application of d-c crane control.

For additional data, ask for item B-934, using the coupon on page 121.

Murray Manufacturing Corp., 1250 Atlantic Ave., Brooklyn 16, N. Y., announces its 1958 catalog of **electrical distribution equipment** including safety switches, fusible service, circuit breakers, load centers, and meter mounting equipment.

For additional data, ask for item B-935, using the coupon on page 121.

The new and expanded lines of **industrial and commercial fluorescent fixtures** illustrated in a new catalog offered by **Leadlight Fixture Co.,** 800—100th Ave., Oakland, Calif., will be of interest to architects, contractors, engineers, and industrial designers.

For additional data, ask for item B-936, using the coupon on page 121.

Construction features, performance data, dimensions, ratings, etc., of the company's complete line of **fans, blowers and roof ventilators** are covered in a new catalog series available from the **Peerless Electric Co.,** 1401 W. Market St., Warren, Ohio.

For additional data, ask for item B-937, using the coupon on page 121.

Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa., offers descriptive bulletins and sample architectural specifications on its Chromalox automatic electric unit which supplies heat and natural cooling and ventilates with fresh outdoor air.

For additional data, ask for item B-938, using the coupon on page 121.

"How **Fluorescent Lamp Ballasts** that Bear the CBM Emblem Insure Your Lighting Investment" is the title of a new 16-page brochure just issued by **Certified Ballast Manufacturers,** 2116 Keith Bldg., Cleveland 15, Ohio.

For additional data, ask for item B-939, using the coupon on page 121.

Corrosion resistant wrought iron conduit is illustrated and discussed in an eight-page booklet available from **National Electric Products Corp.,** Room 900, 2 Gateway Center, Pittsburgh 22, Pa.

For additional data, ask for item B-940, using the coupon on page 121.

A new catalog available from **Prescolite Manufacturing Corp.,** 2229 Fourth St., Berkeley, Calif., gives installation details of the company's new **Preslock series of ceiling lighting fixtures.**

For additional data, ask for item B-941, using the coupon on page 121.

An **underfloor electrical distribution system** for industrial and commercial buildings is the subject of a colorful sixteen-page bulletin available from **Walker Brothers,** P. O. Box 33, Conshohocken, Pa.

For additional data, ask for item B-942, using the coupon on page 121.

An illustrated guide containing over 100 pages of technical information, cabinet sizes, knockout arrangements, etc., for their line of **control devices** is offered by **Wadsworth Electric Manufacturing Co., Inc.,** 20-34 W. 11th St., Covington, Ky.

For additional data, ask for item B-943, using the coupon on page 121.

Complete information for the use of the current-limiting Cordon® **circuit breaker for short-circuit protection** on low-voltage systems is given in a new bulletin published by the **I-T-E Circuit Breaker Co.,** 19th and Hamilton Sts., Philadelphia 30, Pa.

For additional data, ask for item B-944, using the coupon on page 121.

A low-voltage **distribution switchboard,** which accepts any combination of six different types of protective devices, is the subject of a 32-page book issued by the Distribution Assemblies Department, **General Electric Co.,** Plainville, Conn.

For additional data, ask for item B-945, using the coupon on page 121.

Understanding the code

(Continued from page 90)

Yet, it must be so designed that the operation of any one device will open all ungrounded conductors. It must have an overcurrent device in *each* ungrounded conductor, be of the indicating type, and have suitable interrupting capacity.

Isolating switches are required to be installed ahead of all oil switches and all oil or air circuit-breakers, except on metal-enclosed switchgear with removable panels. These isolating switches are required to be of the type which can be grounded in the open position, such as a double-throw switch with the bottom clips grounded, unless means is provided by the utility company for grounding. Removable-panel, metal-enclosed switchgear which cannot be opened unless the circuit is disconnected is exempt from this requirement.

Section 2392 allows the service circuit-breaker to be on the primary side of the transformer if it properly protects the secondary circuit and if it is manually operable from outside of the vault, provided that the secondary serves only one set of mains. This would represent an unusual case, but it is occasionally done as in the case of a step-down lighting transformer supplying one set of main conductors to a lighting panel.

Overcurrent protection

We come now to Article 240 of the Code which governs overcurrent protection. This statement may seem strange, coming as it does at the end of our service equipment discussion, a good portion of which was devoted expressly to service overcurrent protection. But, as I may have indicated at the beginning of this series, the Code has general rules and special rules. There are numerous instances in the Code where overcurrent devices are mentioned in connection with a particular application, such as branch circuits, feeders, and services which we have already covered, and motors, signs, and many other applications yet to be discussed. Article 240, however, is a

general set of requirements for overcurrent protection as these requirements apply in a general way to many things.

The theme of Article 240 is stated in section 2401 which states simply that an overcurrent device is "provided for the purpose of opening the electric circuit if the current reaches a value which will cause an excessive or dangerous temperature in the conductor or conductor insulation." The details of how this is accomplished will be attempted next month.

Answers to Code test questions are as follows: (1. *F* Note at beginning of "Services Exceeding 600 Volts") (2. *F* section 2387) (3. *T* sec. 2387-a) (4. *F* sec. 2387-b) (5. *F* sec. 2387-c) (6. *a* sec. 2389-c) (7. *c* sec. 2389-d) (8. *c* sec. 2387) (9. *a* sec. 2387-a) (10. *b* sec. 2391). 2389-d) (8. c. sec 2387) (9. a sec 2387-a) (10. b sec 2391).

Contractors tell how

(Continued from page 86)

go the pleasure of lighting up for outdoor living unless the electrical contractor uses the same irresistible sales tactics that make money for the automobile dealer, the furniture store, and the milliner—good display. We are using our show windows and our sales floor to make people think about wiring the yard, patio, and garage and about installing fixtures for eating, playing, and working outdoors.

The average cost of an outdoor lighting job, complete with lighting fixtures, is about $40. Many of the new houses, especially those built to sell, are equipped with outdoor lighting, and we sell our share of this. But we also see unlimited opportunities for selling people who own older houses, and we are going after this untapped volume now.

A counter display on outdoor wiring is seen by everyone who comes in. If the window display has been overlooked, the customer must see the counter display and also the outdoor lighting units featured in our small but select showing of light fixtures on the ceiling.

We have a highway location, at the edge of town, where an attractive building and display windows, lighted at night, claims the attention of passing motorists. People passing in cars are from the city and also from the prosperous rural area, where farmers have good incomes to spend. Outdoor lighting is especially needed by farmers and suburbanites. There are uncounted numbers of those $40 outdoor wiring jobs waiting for some electrician to do in our area—and in many other areas served by contractors located in smaller cities and towns.

When we moved into our modern buff brick building with two large show windows, we felt that we were doing what many other small-city contractors could do profitably. Not every contractor can have a new building constructed especially for show-room features, but we feel that all contractors can make better use of what display possibilities they have.

We find that it pays to attract people for the smaller sales and services and then to regard them as old customers worth holding. The people we are selling outdoor lighting this year will hear from us a few months later. Some will have us install air conditioning; others will need repairs, new lighting fixtures in the home, and other services that we will sell because we are convinced that the electrical contractor can always sell more when he asks people to buy. Coordinating display with sales and advertising is a simple formula that pays for us.

Miami newspaper

(Continued from page 38)

The whole system is not unduly compressed, as the planners had plenty of room and wanted it spread out with well-defined control points *near* all equipment. All the important electrical equipment and controls are in separate rooms. The system is thus easy to service.

Room for future expansion

Adequate space has been planned for the potential addition of 21 more presses along with the additional switch gear and press controls which will be required if and when Miami's rapidly-growing population will require redoubled production facilities.

A 3,000-amp, 480-volt, 3-phase bus duct for the air-conditioning units was extended from the basement vault to the third-floor "pent house."

After much experimentation with lighting which would reduce the glare on the large amounts of shiny metal used in the composing room, the luminous ceilings were found to fill the bill. They provide excellent illumination with no

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(September 1958)

shadows and no harsh reflections.

Another excellent feature of these ceilings is the fact that the extensive electrical conveyor system, which carries news and ad copy to the composing room, can be located above the plastic ceiling to greatly improve the room appearance. Conveyors are completely concealed, yet if even one paper should fall out of the carrier, it can be plainly seen as a dark shape on the ceiling.

Success through cooperation

On the News job, trade and professional relations were of a high order. There was a completion deadline specified but it was not closely enforced as the newspaper first of all wanted an efficient and orderly installation. To this same end, part of the work was done under contract—those parts which from their nature could be reliably estimated—and the novel and original parts of the work were done on a time-and-material basis. This eliminated inefficient rushing, piling on of extra help and overtime, and skimping of any parts of the job; and this policy produced a better installation and fairer working conditions than in much of the speculative building where contractors are forced to "gamble" on marginal work.

The design, job organization, and work layout, were the result of close co-operation by the designer, the contractor's project manager, and the special staff of mechanical and electrical experts of the newspaper. These included: N. H. Richards and H. B. McLeod for the contractor; Weed, Russell & Johnson architects; C. O. Grannis and John M. Hefley of Rader and Associates (engineers), Julian J. Eberle, Glenn Elvidge, Ed Warriner and Frank Gaussiran of the News.

There was very little overtime on the job, with a maximum labor force of 75 electricians and 22 helpers and an average of 60 and 15. The electrical work took 15 months to complete, and the total cost ran to nearly $1 million, with about half of it in extras.

A 25-ft. square shop was provided for the electrical contractor on the job in addition to a large shack outside and 1250 sq. ft. of stock room space.

Network analyzer

(Continued from page 66)

ances are generally not pure, and have a small amount of resistance.

Load units are fully calibrated in per cent watts and per cent vars. By means of indicating lights, the operator can quickly determine whether the proper power is being absorbed. A rotary switch is incorporated on each unit for readjusting the load to the desired value.

Four load units are contained in a single drawer. Each load may be set directly in per cent watts and per cent vars. These and all other units are front-drawout type for complete accessibility from the front of the analyzer.

Each generator is equipped with instrumentation for assistance in balancing the network under analysis. Each has independent magnitude and phase angle controls for varying voltage and power output.

Line impedance units are available as standard or pi-lines and may be set directly in per cent resistance, per cent reactance and per cent mhos.

Other available units include capacitors and transformers. Capacitor units, used to represent system capacitance, are calibrated directly in per cent mhos — the equivalent of per cent reactive vars, in most instances. A capacitor drawer contains twelve capacitor units, each with two control switches — one for large steps, the other for small increments.

Transformer units are provided in multiples of eight in a standard size drawer. Each unit has large and small voltage step controls. Magnetizing current is extremely small, resulting in exceptionally good over-all accuracy.

The analyzer operates from a standard three - phase, 60 - cycle power source. A set of three voltage-stabilizing transformers, and three electronic voltage regulators, included in the bottom portion of the control center section, is the only power supply equipment necessary. Rotary equipment, such as motor-generator sets, is not required.

Overall height of the analyzer is seven feet. Lines and loads, and generator units are all in rack cabinets which are 22 inches wide by 24 inches deep.

Distribution circuit

(Continued from page 73)

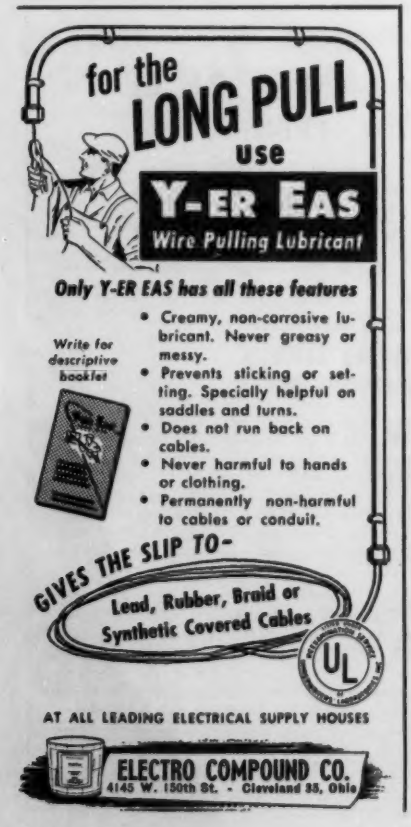
dinated with his system. There is no need for him to buy more capacity than is required to suit his needs.

Current transformers can be provided on the transformer low voltage bushings, if the purchaser wishes to include metering and/or special relaying. Again, the flexibility of the Suburbanite design is extended in the form of a choice of current transformer accuracy class.

Should the application require a more sensitive means of ground fault detection, this likewise can be supplied through the use of current transformers and special relaying. The selection of metering equipment also is open to the customer and most special metering requirements can be satisfied.

Minimum maintenance within economic limits is of prime importance in the selection of component parts for a particular Suburbanite substation. A regular program of inspection may vary for each user and will require some experience on his part in determining a satisfactory time interval between inspections based on operating conditions and climatic environment.

Under average conditions, it is recommended that the recloser be completely inspected once each year. The oil should be replaced with new, clean, dry electrical insulating transformer oil once each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year or after 75 interruptions, whichever occurs first. This number of operations assumes a distribution of fault currents between minimum tripping and maximum interrupting capacity of the recloser.

This recommendation is based on the Standard Operating Duty outlined in NEMA Standard SG-13, Paragraphs 5.10, 5.11, and 5.12; and AIEE Standard No. 50, Paragraphs 29 and 31, pertaining to automatic circuit reclosers. Oil deterioration rather than mechanical wear of the equipment itself is the main reason why maintenance is necessary. Most utilities now have reclosers in operation, and from their past experience they have established maintenance schedules that they are now following and which they consider adequate.

Recommended inspections

The LTC equipment used with all Suburbanites is the standard mechanism normally used for this size LTC transformer. It is recommended that a complete inspection of this mechanism be made when the Suburbanite is installed and an inspection be made one year later to determine and to establish an adequate maintenance schedule. A recognized conservative estimate of this mechanism's endurance is 2,000,000 operations at no load and 250,000 operations at rated current.

Although the Suburbanite has been developed by Pennsylvania Transformer to meet the ever-increasing demand for an economic method of providing a completely protected distribution circuit in remote locations — such as rural areas, small towns, and outlying industrial sites, its advantages are worthy of consideration in any application where it is desired to establish a protected distribution feeder that insures maximum continuity of service.

NAED president

(Continued from page 46)

"This year we will have zones 8 and 4, the whole Southern region. Manufacturers' executives and local people are invited. At that meeting, subjects will be discussed from the grass roots viewpoint. We hope to come out of that meeting with a better understanding of one another's problems. After all, manufacturers and distributors are partners in the distribution industry."

Hamblen, who has been active in NAED since 1938, was elected to the presidency at the June convention in San Francisco. He has been a citizen of Houston since 1925, and he and his partner, Frank De Walch, bought Southern Electrical Supply in 1934. At that time it was contained in a building 20 by 40 feet for a total of 800 square feet. The enterprise now occupies 100,000 square feet, by estimate, with branches in Beaumont, Austin, Corpus Christi, and San Antonio, all tied together with teletype. For serving this Gulf Coast and Central Texas area, an inventory valued at 1½ million dollars is maintained.

Hamblen's long legs carry him with king-size strides, or he would never get to all the places required by his manifold interests. In Houston, Jake Hamblen is known as a work horse, who enjoys a long list of activities outside his personal business. The list of these outside interests is almost fantastic.

He admits to playing golf "every chance I get," but adds, "I guess you would say kids are my main hobby." He is past president and still active with the Sam Houston Boy Scouts of America, which involves 14 counties and three camps.

He is current local chairman of the National Conference of Christians and Jews, is a member of the board and organizer of the Fannin State Bank of Houston, chairman of the board of the Schulmacher Co., sponsor of the Minimax food chain doing a volume of 60 million dollars a year. In World War II and the Korean police action he was advisor to the War Production Board for the electrical wholesaler section, at a dollar a year, and he recalls, "they still owe me about six dollars." He is active in local and state politics.

One of his most recently - acquired responsibilities is that of member of the board of navigation and canal commissioners for the Port of Houston. Of this one, Hamblen is especially proud for, as he points out, the Port of Houston "is third largest export point in the United States, and we are in competition for business with New York, Baltimore, Philadelphia, New Orleans, Biloxi, and Galveston." Hamblen has been ribbed considerably about the possibility of using the new Port of Houston boat for entertaining pros-

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The Blackhawk No. 540 one piece box support slips into the wall opening and tabs are bent back to hold it in place. After the switch box is installed, the tabs are bent to the inside of the box squeezing it firmly in place. It's that simple and quick.

It makes a permanent installation because the Blackhawk 540 box support is a large single piece . . providing rigid, unified support. It does not wiggle or saw because it is parallel to the wall.

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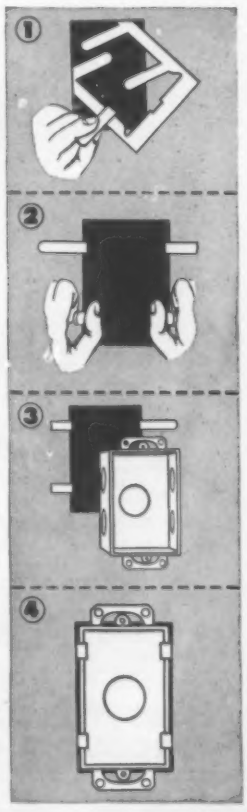

Blackhawk Industries

BLACKHAWK INDUSTRIES

DUBUQUE, IOWA

pective A. & M. football players. The boat was commissioned for the purpose of taking prospective shippers on an inspection of the Houston ship channel.

Finally, there's that matter of his graduation from A. & M. as a textile engineer. He was born and raised in Taylor, Texas. That always has been, is now, and probably always will be cotton country. It was natural for young Jake Hamblen to get a textile engineering degree, and to ambitiously look forward to a career in textiles.

After graduation, however, there were no textile jobs available immediately. So he went to work for a brother-in-law at Brenham, Texas, wiring houses and installing lighting systems. Somehow he met the sales manager for the Empire Electric Co., Houston wholesaler, and jumped at the opportunity of working for this firm. Its location was close to the Cotton Exchange and it would be convenient for keeping tab on openings in the textile industry. So he went to Houston and, among others, contacted the Anderson Clayton Co., a big Houston cotton concern, and put on file his application for employment.

This was in December of 1925, but by 1927 there was still no cotton job. Meanwhile, Empire Electric ran into trouble and was sold. Hamblen worked for an electrical contractor for a while, and then went back to what became the Roberts-Empire Co. Soon thereafter he and Frank De Walch became acquainted. Hamblen was about frustrated looking for a job in cotton, and the partnership venture resulted in 1934.

"You know," said Hamblen, grinning broadly, "that application of mine is still on file over at Anderson Clayton. I know those people over there. I keep asking them what they are going to do about it. I've about decided they're not going to take any action on my application for a job in the cotton business."

Residential heating loads

(Continued from page 60)

purpose of obtaining data for studying characteristics of this type of load in residences. A wiring diagram of one of the installations is included. The descriptions with the photographs, and with the wiring diagram, are self-explanatory.

To summarize, it may be stated that metering of electric house heating and heat pump loads for billing purposes presents no particular problem due to the fact that present-day electric meters have high load carrying capacity sufficient to meter most installations with self-contained meters.

Where special test information is desired by sales, engineering, or research departments, metering equipment can readily be selected and installed to obtain the information desired.

Time switch convenience

(Continued from page 40)

tractor installations of Astronomic dial time switches.

The Astronomic units never require resetting; they automatically compensate ON and OFF times to conform with the sun's schedule. Completely mechanical, they save the contractor making field trips to adjust them each month or so. These dials are also now available in combination time switch—service entrance units, containing time switch, fuses, and automatic disconnect, in one raintight enclosure.

The more applications a contractor finds, the more time switches he'll sell—and it all adds up to extra profits the year 'round. From farm to factory, there's time switch profits.

Poultry and stock feeding

On the farm, they serve not only for the control of poultry and hen house lighting but for automatic poultry and stock feeders as well. Time switches also control ventilation, pumping, and other automatic equipment on the farm.

In factories—how about a signal timer to sound bells? This same signal timer can be sold to schools, hotels, institutions, and railroads.

In the South particularly, areas open for greater exploitation of time switche sales range from oil and water pumping on through flower growing and lawn sprinkling. Program time switches, for example, are a must for oil well pumping. A well can only pump a certain length of time according to law. And, the switch also betters production for the well owner.

Vegetation irrigation

To go from oil wells to flower beds . . . time switches are used for the control of lighting in flower growing. Mum growers make great use of them, to provide the exact amount of daylight lighting needed to produce optimum results.

In greenhouses, a time switch installation will provide the necessary control for in-bed mist propagation. Special fast moving dial units will allow a fine spray every few seconds during daylight hours, for controlled and exact results.

Similar units are used in lawn sprinkling, roof sprinkling and cooling, and the control of irrigation systems. Home owners may feel they've reached the peak in lawn sprinkling ease when they have an underground sprinkler system installed. *But*—they've still got to turn the water ON and OFF. That means an expenditure of time and labor — plus a good chance of wasting metered water through oversprinkling or forgetting to close the valve.

Time switches handle this job. In fact, there's one that will not only turn sprinklers ON for the exact—yes, the exact time needed for watering a specific section, but will also prevent sprinkling on days when the ground doesn't require it. If there's been rainfall, the time switch keeps sprinkling OFF. This installation will save the buyer its cost in water bills alone

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for the first season. And think of the convenience and the time he saves.

Use the "savings" feature in selling time switches. Selling points are: (1) a time switch does the job *when you need it;* (2) there's no waste of current; (3) there's no "forgetting" to turn lights or equipment ON or OFF. The time switch does the job better and saves money at the same time. All that's left for the contractor is to know the many jobs a time switch is equipped to do—and broaden his selling picture.

It's just a matter of getting to know your product and what it can do for your customer. *Your cash register will show you what it can do for you!*

Duty to contractors

(Continued from page 45)

count-savings of $25 monthly or $300 for a year," he said.

Brockman perhaps realizes that a good journeyman does not necessarily make a good businessman the day he goes on his own, and this supplier keeps the welcome mat out to him for requested advice.

Bidding protection necessary

The Sarasota supplier points out the danger when a "little" fellow is bidding. Desperate to feed his family or prove his business acumen (and simply because the competition is similarly foolish), he picks up and does a job without investigating the general contractor who, until he sells the house, never gets around to paying off.

"Why should the electrical contractor be a party to this gamble where the subs carry the investment load?" Brockman asked. "The contractor needs to be alerted to the danger. The wholesaler can very often put the finger on an unethical general contractor.

"If the electrical contractor doesn't get paid, chances are that his jobber won't. We as jobbers can only succeed by making our customers strong," he emphasized.

He feels that in cases where a jobber grants an unwarranted extension of credit and the recipient of his left-handed favor fails, the whole electrical craft suffers. If, in the midst of plenty, contractors can't make a decent living because of the foolishness or greediness among their compatriots (aided and abetted by credit offered by jobbers where it should have been withheld), the whole industry suffers.

The lesson Brockman and other jobbers point up is plain. Today's small or beginning contractor is potentially the big operator of tomorrow. Consensus of jobbers is that the contractor should hearken to the "voice of experience" at the supply house. At the same time, the contractor needs to cease depending on the wholesaler as a chief financial source.

Meter department

(Continued from page 54)

former from the ratio of the precision transformer. By lagging the current applied to the wattmeter 90 degrees from the voltage applied to the precision transformer secondary, any deviation from 180 degrees of the secondary voltage on the test transformer with respect to the secondary of the precision transformer results in an increment of voltage that will indicate watts on the detector wattmeter. This reading of watts is directly proportional to the phase-angle difference of the test transformer voltage to the phase-angle of the secondary of the precision transformer.

The current transformer testing equipment includes control apparatus, manual phase-shifting apparatus, and two package-unit precision current transformers (see Figure 5). One package-unit is used for testing current transformers from 5 to 500 amperes; the second unit is for testing current transformers from 600 to 5000 amperes.

The procedure in testing current transformers is similar in principle to that of testing potential transformers. The detector wattmeter will indicate the differential of current of the secondary currents of the transformer under test, and the precision transformer when 180 degrees (approx.) out of phase from each other is applied to the current coil of the detector wattmeter with 200 volts applied to the potential coil of the wattmeter. The resulting wattage is directly proportional to the error in ratio of the precision transformer.

The phase-angle test is accomplished in the same manner as with the potential transformer, except that the voltage applied to the detector wattmeter is rotated 90 degrees with a phase shifter using a

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rotating wattmeter as indicator. This rotating wattmeter stops when the voltage and secondary current of the precision transformers are 90 degrees from each other. If the secondary currents are not exactly 180 degrees out of the phase, an increment of current in phase with the voltage applied to the detector wattmeter results. The resulting wattage on the detector wattmeter is proportional to the phase-angle difference between the secondaries of the transformer under test and the precision transformer.

Ratio and phase-angle tests

The ratio and phase-angle tests are made at 100 per cent and 10 per cent of the rating of the current transformer under test. The degree of accuracy of the test at 10 per cent load is 1/10th of the degree of accuracy at 100 per cent load since the amount of current producing the differentials of current is 1/10th that at full load.

The panels of both the potential transformer and the current transformer testers are quipped to connect whatever type of burden the operator wishes to place on the transformer under test.

The potential transformer tester is housed in an oak-panel cabinet for safety. The current transformer tester cabinet is made of similar material for matching appearance. The di-electric test is performed previous to the ratio and phase-angle tests. By following definite polarity connections of the detector wattmeter and the instrument transformer, a positive or negative reading on the wattmeter can be made to indicate high or low ratio and plus or minus phase-angle error.

Placing the primaries of several current transformers in series saves considerable time. Care must be taken to close the secondaries of all other current transformers while testing any one current transformer. The potential test can be made very quickly since connections are easy to make, and procedure for obtaining the readings is short. Each test apparatus is supplied from a four-wire delta circuit.

Since moving into our new building, we have increased the testing production of instrument transformers 43 per cent.

Another improvement in the operation of the department was the purchase of a photocopier, so that the cards used from one district for meter change orders can be photographed and the copy placed in the meter history folder. This not only saves considerable time but eliminates the possibility of mistakes in transcribing the data.

A display board with typical meter installations is located in our warehouse, and any customer or electrical contractor seeking information as to the proper equipment to be installed for metering can see it (see Figure 6).

It has been definitely proved that with modern test equipment and adequate housing facilities the meter department will operate more efficiently and result in lower cost of operation per meter.

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Wholesale distributor

(Continued from page 43)

come committed to additional products which serve primarily to drain the distributor's resources. This latter decision will invite additional competition but is the sounder decision for the distributor in the long run.

(5) All of these developments will contribute to continuing strong price competition. With users having a wide choice of lines and sellers of these lines pressing for greater volume, there is not likely to be a decrease in the downward pressure or prices.

In the light of these expectations, the key to the established distributor's future is *flexibility*. This means flexibility as to markets, product lines, selling methods, and general operations. The distributor cannot afford to let any part of his business go unchallenged, because if he does a competitor will challenge it by finding a way of doing a given job better. This is one universal law of the free enterprise system, and the more competitive a market is the less it can be ignored.

Constant surveillance of markets is required. In general, geographical markets of electrical distributors have been shrinking as a result of the growth of secondary wholesale centers, although sometimes this shrinkage can be forestalled by the establishment of branches. Market coverage, therefore, tends to become more intensive. New customers are sought; the frequency of sales calls tends to increase; and more service is extended to customers.

Distributors need detailed product, sales, and inventory records in order to determine which lines should be kept and which dropped. A regular system of product checks involving the use of these records is also necessary.

Good management essential

The whole promotional pattern of the electrical distributor needs a new look. Outdated and inadequate selling methods must be strengthened. Better sales personnel is required, and salesmen need better training than they generally have been getting.

The internal operations of the distributor should be subject to regular investigation. This includes warehousing operations, order-filling procedures, delivery methods and policies, billing methods, credit operations, and accounting and costing procedures.

Taken together these needs constitute a large order, but there is no substitute for this action. What these requirements add up to, of course, is first rate management from top to bottom. The distributor who is attempting to improve his position in the market in terms of sound, long-term growth cannot afford anything less than the best management personnel he can obtain and the best management practices he can find.

In addition to the steps which individual distributors can take,

there are other things which can be done. Manufacturers often speak of the distributor as an extension of their own sales organization, but this relationship does not appear, in fact, to be the typical one.

There are some manufacturers, and you know who they are, who do have an excellent distributor-relations policy. These companies do not simply give lip-service to this policy. They have made it a working policy, and this, obviously, is the thing that counts. Many manufacturers in the electrical field need to examine their relations with distributors. Unless a manufacturer has a line which can be sold effectively direct to industrial users and utilities, his welfare is tied closely with the welfare of his distributors. This is particularly true with respect to construction materials sold to contractors.

A distributor point of view

To strengthen their distributor ties, manufacturers need to develop a distributor point of view, or at the very least to appreciate it. Manufacturers are prone to feel that a distributor should automatically be as interested in their line as they are themselves. This is not a very realistic approach, since the profits of the typical apparatus and supplies distributor are derived from scores of lines, sometimes hundreds of lines.

It is the manufacturer's responsibility to develop interest on the part of the distributor in his line. There are many ways by which this can be done. A satisfactory margin is certainly a major factor. Careful and reliable service is another. Promotional help and carefully organized and planned sales training of distributor personnel is particularly important.

The manufacturer's expectations of the distributor must be reasonable and realistic in terms of sales volume, inventories, and the time the distributor is expected to devote to the line. The manufacturer must stand ready to give promotional support and technical aid when needed. Above all the manufacturer must work *with* the distributor; not *against* him; and not *around* him. Nothing is more detrimental to good manufacturer-distributor relationships than for the manufacturer to cut out the distributor when a particular piece of business looks attractive.

It is only fair to add in this connection that a joint responsibility is involved, and the manufacturer who does a conscientious job of working with distributors deserves some loyalty in return. And he certainly should expect satisfactory representation of his line. Maintaining a good distributor-relations policy involves a substantial expense on the part of the manufacturer, and he can legitimately expect that this expense will bring a fair return. Consequently, the distributor has obligations to consider as well as benefits under this relationship.

As we look at the overall distribution pattern of electrical apparatus and supplies, and consider the relationships of the distributor and the manufacturer, the agent, and the user—especially the contractor—one conclusion is inescapable: the distributor cannot run the business of the manufacturer, the agent, or the contractor, but he can run his own. Little is gained by assailing these other members of the industry. Their shortcomings, from the viewpoint of the distributor, can be, and in fact have been, made known, but until the point is reached where each distributor has a clean slate there will be rebuttals.

One positive course of action, therefore, is for the distributor to put his own house in order and keep it so. By doing this, the distributor is likely to find answers to many of his problems.

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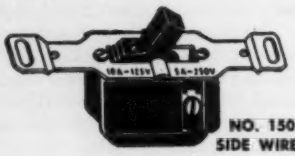

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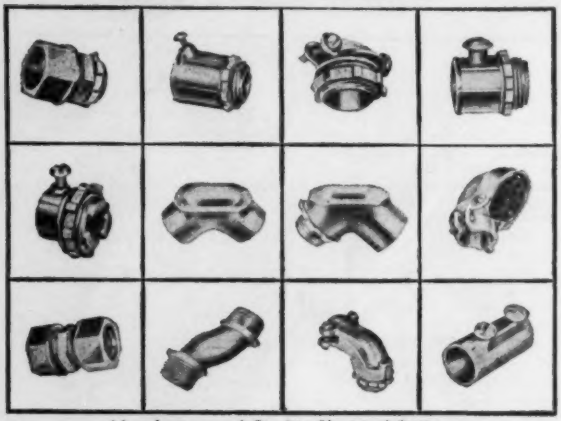

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